EVIDENTIARY HEARING

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
Application for Certification	)	Docket No.
for the Morro Bay Power Plant	)	00-AFC-12
Project	)	
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VETERANS MEMORIAL BUILDING

209 SURF STREET

MORRO BAY, CALIFORNIA

THURSDAY, JUNE 6, 2002

9:15 a.m.

Reported by:
James A. Ramos
Contract No. 170-01-001

COMMITTEE MEMBERS PRESENT

William Keese, Presiding Member

James D. Boyd, Associate Member

HEARING OFFICER AND ADVISORS PRESENT

Gary Fay, Hearing Officer

Michael Smith, Advisor

STAFF AND CONSULTANTS PRESENT

Caryn Holmes, Staff Counsel

Marc Pryor, Project Manager

Richard A. Anderson

Andrea Erichsen

Michael Thomas
Regional Water Quality Control Board

Peter Raimondi, Consultant to RWQCB
University of California, Santa Cruz

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Nelson Sullivan

John Barta

Pat Renshaw

I N D E X

I N D E X

P R O C E E D I N G S

9:15 a.m.

HEARING OFFICER FAY: While we're waiting for the TV monitor to pick us up, I just have a few announcements. A few changes to the agenda: We're going to begin today with a brief review of the 316(b) study process and the technical working group and how that was carried out. And also, the Regional Board's witnesses were listed separately, they're going to be testifying, Michael Thomas and Pete Raimondi will be testifying, along with the staff panel at that time.

And I've reviewed the time limits with the parties. We would very much appreciate it if people can stick to those time limits, because we not only have a very full day today, at least as long as yesterday, but the Commissioners have to be in the Bay Area tonight, and so we'd appreciate your help on keeping things succinct.

I also want to mention that Marc Pryor, who is standing in back -- the tall, handsome fellow in the blue shirt -- is helping us with the public advisor role. We don't have anybody from the Public Advisor's office, but Marc will be taking notes on anybody that wishes to make public comment. And later I think he's going to have some blue cards or some equivalent of that so we'll be sure to know who wants to give public comment.

I would like to call people's attention to the briefing schedule that is in the notice for today's hearing, that the change to that would be that we will not address in the briefs any matters that deal with the habitat enhancement plan proposed by Duke or the aquatic filter barrier or Gunderboom, or the combination of the two. But everything else regarding the group four topics will be covered in the briefs.

Opening briefs from all parties are due June 28th, and reply briefs due July 12th. And we will have expedited transcripts of the hearings; however, the hearings are long, so, you know, don't expect three-day expedites. It would be shorter if it would have been if we hadn't asked for an expedite, I'll put it that way.

And I also want to, on behalf of the Committee, direct the parties to communicate with each other, and, if at all possible, submit a joint recommended schedule for submittal of information on the habitat enhancement plan and AFB proposal, and schedule for a staff review of that proposal, publication of analysis, testimony, etc., and recommendation on hearing dates since we are holding that part of the record open and will meet again to take testimony on that mitigation plan.

Anything else before we get started?

MR. CHIA: Mr. Fay?

HEARING OFFICER FAY: Yes?

MR. CHIA: This is Dan Chia. Can you hear me?

HEARING OFFICER FAY: Yes.

MR. CHIA: I just wanted to mention that I've been in contact with Deborah Johnson. She's going to join us shortly. I'm going to patch her in by phone. She says that she may not be able to stay with us beyond 1:00 o'clock this afternoon, so I suspect she may want to make some public comment prior to her departure.

HEARING OFFICER FAY: Okay. Well, when there's a little break in the action, could you catch our attention and we will try to take her comment at that time.

MR. CHIA: Okay.

HEARING OFFICER FAY: Good.

CHAIRMAN KEESE: Well, before we get started, I would just like to welcome everybody to the third day of our fourth set of evidentiary hearings, and, as you know, we will continue to have hearings here in Morro Bay.

I would particularly welcome those members of the public who are joining us and those who are watching us on local TV. I believe the community deserves commendation for making this very important proceeding available to the public so well, and we thank the people who are televising us in the most courteous manner possible. It's a totally unintrusive activity, and we're happy to see it happen.

Commissioner Boyd?

COMMISSIONER BOYD: Well, I'd just like to echo your sentiments. Everybody here has been very nice to us and we appreciate that. There are communities that aren't so nice to us.

(Laughter.)

HEARING OFFICER FAY: One additional thing is I notice that in the back there was an applicant's exhibit list.

Mr. Okurowski, I guess that's not the

one we discussed yesterday. It looks like the one I picked up still has blanks on it. Do you have --

MR. OKUROWSKI: I will be distributing what you looked at and all of the numbers up to that point. And if we add anything before that, let's say we -- if you could start at 267 I'd appreciate it, so I don't have to renumber them again. Because I made a mistake last time.

HEARING OFFICER FAY: Okay, and you'll be sure all the parties get copies of that?

MR. OKUROWSKI: Absolutely.

HEARING OFFICER FAY: Okay, all right.

We'd like to begin, then, with an overview from the representatives from the Central Coast Regional Water Quality Control Board regarding the 316(b) process, and Ms. Holmes, if you could help us with that? Michael Thomas is here representing --

MS. HOLMES: Yes. Michael?

HEARING OFFICER FAY: What I think would be appropriate is that this need not be in the nature of testimony, if you could just give a succinct foundation for the benefit of the Committee and the public as to roughly how this process works and how you went about it in this case.

MR. THOMAS: Okay. I'm not sure how to get this on to the screen (indicating).

My name is Michael Thomas. I'm an environmental engineer with the Regional Water Quality Control Board. I'm the project manager overseeing Duke Energy's application for an NPDS permit for the modernized facility, and I'm going to give you a very brief overview of our process and introduce Dr. Raimondi, an independent consultant to the Regional Board on this project.

Duke Energy submitted an application for an NPDS permit to the Regional Board, and it is a permit for a once-through cooling water system for the modernized facility. In response to that application, Regional Board staff required entrainment, impingement, and thermal effect studies in order to evaluate the application.

A technical work group was established by the Regional Board to oversee this process, and the technical work group includes staff from many different agencies. Any agencies that are interested in attending can attend.

We've had staff from the National Marine

Fisheries Service, Energy Commission, Department of Fish and Game, Coastal Commission, and we also have observers from CAPE, the Sierra Club, City of Morro Bay, and other folks, citizens that are interested. So we have quite a large group that had been meeting on a regular basis.

We also have independent scientists, probably most importantly. The independent scientists that we hired are Dr. Raimondi, who is here today from University of Santa Cruz, Dr. Kay from Moss Landing Marine Labs, and Dr. Foster, who is an independent consultant to the Energy Commission staff also attended. And we also hired additional independent consultants as needed for specific subjects.

All of the studies that were done, which I will very briefly mention today, all of the studies that were done were done under the direction of the technical work group. Thermal effect studies included sandy beach survey, subtidal survey, rocky intertidal habitat survey, and thermal plume dispersion studies. We also did an impingement study and entrainment study.

Just to orient you to the facility, which you've probably seen several times by now, this is the power plant here (indicating). This is Morro Rock, at the entrance to Morro Bay (indicating). The intake structures are located about here (indicating), and the discharge structure is located here, on the north side of Morro Rock.

The thermal effect studies, I already mentioned them very quickly, the sandy beach survey, subtidal survey, plume dispersion survey, and rocky intertidal survey. And what we found is that there are impacts due to the thermal plume, and they are located, those impacts can be found along the north side of Morro Rock, approximately 600 feet of rocky intertidal habitat is degraded due to the thermal plume. And this is the canal that is the discharge structure, so the warm water exits here along the north side of Morro Rock and disperses offshore.

The impingement study shows that approximately 1.4 tons of fish per year are lost due to impingement. That is, impingement is when fish get caught on the traveling screens that are located on the front of the intake structure. Also, we lose about 0.4 tons of invertebrates per year on those traveling screens.

Entrainment is the big issue that is before the Commission today, and the way staff has characterized the entrainment loss, we've said in our staff reports that it's 17 to 33 percent. There is a great deal of controversy over those numbers, and I'm sure you'll hear much more about that today. The calculation for coastal tax is about three percent.

Now, some folks, this 17 to 33 percent range, there are some folks that say it underestimates the actual loss to some taxa, and it does underestimate the loss for some taxa, and it overestimates the loss for other taxa. But we considered it to be a reasonable range, and the best estimate for most of the taxa from the estuary.

The way we interpret these results, or the results of these studies is that we consider the -- I'm talking about Regional Board staff here. It's not the Regional Board itself, it's Regional Board staff. The Regional Board has not made a determination on this project.

HEARING OFFICER FAY: If I can just interrupt you, today will you be testifying on behalf of the Regional Board staff?

MR. THOMAS: Yes.

HEARING OFFICER FAY: As opposed to yourself? You'll be representing the staff's position?

MR. THOMAS: Yes.

HEARING OFFICER FAY: Okay.

MR. THOMAS: Yes, because what I will be representing is a staff report that went to the Board, approved by the executive officer. So it's actually the executive officer staff report.

HEARING OFFICER FAY: All right.

MR. THOMAS: We consider the impingement impacts to be relatively minor. We consider the thermal discharge impacts to be not unreasonable as based upon what it would take to eliminate those thermal discharge impacts, which is essentially moving the discharge offshore.

The entrainment impacts, we do consider those to be significant or important, and at the staff level we do think that they should be addressed, and we relayed that information to our board on a number of occasions. There is a relatively large proportion of loss of larvae from the estuary, and the Regional Board -- as I already mentioned, the Regional Board's independent scientists and Regional Board staff consider that 17 to 33 percent range to be best representative of that loss.

And Dr. Raimondi is here today from the University of Santa Cruz. He is one of the Regional Board's consultants on this project and he will go into more detail on the entrainment study and the results, and the interpretation of those results.

And we have to switch our computers; it will take just a second.

DR. RAIMONDI: What I'm going to do now is I'm going to briefly, hopefully briefly go over the models and the usage that we employed to come to the numbers and to the approximation of impacts in Morro Bay. I want to spend a little bit of time in the details, because it's the details that lead to the discrepancy in the numbers and in the modeling exercise.

And I want to say up front that throughout this process, we've been largely in agreement with the other members of the technical working group. We've worked very well together and it's at the end where we have a difference of opinion, and I think it's an honest difference of opinion. You know, I don't view this as a battle, it's just an interpretation of the losses.

HEARING OFFICER FAY: If I could also just add, the idea of this is foundational background. And later you will be representing the actual staff report. So what we want is as neutral a presentation as you can.

DR. RAIMONDI: In fact, that's what I'm going to do. And if there is any point of discrepancy, I will know exactly that these are the range of numbers and there is one that's adopted by one side and one that's by the other.

As Michael already said, we came to the conclusion that the thermal and impingement effects were relatively minor, and I'm not going to discuss those. What I want to discuss now is the method that we used to estimate entrainment and how we interpreted entrainment, and spend a little bit of time doing that.

Here is a general schematic as you've all seen for the intake and discharge of cooling water. There's a couple of features. Everyone knows this, but I want to go over this in a little bit of detail because of the particular circumstances at Morro Bay.

The intake in Morro Bay is in the estuary itself and the discharge is out to the coastal water, and the implication of that is that most of the fish that are entrained in this are estuarian species. There are some coastal species, but the vast majority of entrained species and impinged species are those that are derivative of the estuary itself, and are estuarian species.

The details of this are -- Some of this is cut off on the left side, but you have a whole bunch of organisms that are taken into the power plant and they're both big and small. The big ones are caught on the traveling screens, they're lost to the trash bucket, and those are individuals that are considered to be impinged. As we've noted before, we don't think that that's a large number, and, in fact, at Morro Bay it's a very small number compared to other power plants along the coast. And so we view impingement as not a very important effect of Morro Bay.

The smaller things, the larval forms of fish, invertebrates, the propagules of algae, zooplankton, phytoplankton, all the little things that go through the traveling screens, they're taken into the power plant, go warm-water exits to the open ocean. I think the average discharge temperature above ambient is somewhere around 20 degrees.

And one of the assumptions that we've made, and I'll discuss this in a little bit of detail later, is that the loss of these individuals that have passed through the power plant and exited to the open ocean is complete, meaning that there is 100 percent through-plant mortality. This was an agreement that we made as a technical working group. There is some discussion about that at this point, but that was an operating assumption of the technical working group.

The estimation of ecological effects to entrainment have to do with two things: One is the life history of those organisms, and I'll just discuss this in a second, and then the methods of estimation that have been employed.

The life history really relates to this: Are those organisms susceptible to entrainment, and that is, do they produce a stage that is small enough to get through the traveling screens and into the power plant itself and then discharge to the open ocean?

There are two types of species in marine systems. You can dichotomize them as two types of species. There are closed species and there are open species, or open systems and closed systems. Those that have a closed system have direct development, have big propagules, have big progeny, things like surf perch and sharks and rays, and they're not susceptible to entrainment, so we won't be discussing those types of organisms.

On the other hand, there's a whole bunch of species -- in fact, the majority of marine species, the ones that we're talking about today -- have what are called an open system. And all this means simply, in lay language, is they produce babies that have larval forms that are usually a dispersing form, and they're small. In some cases they're very small. And they can get through the traveling screens, and they are susceptible to entrainment and, therefore, loss is the entrainment; that's the impact.

The species that we're talking about are mainly things like gobies and blennies and sculpins and herring, clams, crabs, lobster, rockfish, all of the common things that you would expect to find in a marine system are mostly in this type of system, which are the open system species.

So how do you go about doing this? To estimate the larval losses due to entrainment is not a very difficult thing conceptually. Logistically, it's very difficult because there is a lot of work involved, but first you calculate the volume of water that enters the plant. You can just estimate that in two ways. You can actually measure it, or you can use the pump function to come up with an estimation of how much water actually passes through the plant. Because it's only that water that can contain the larvae that are lost.

Then you can measure the concentration of larvae that are entrained, meaning in this case you put a net out front, you sample throughout the day, and you just count up the number of individuals in this net, get an estimate of the concentration, which is the number per cubic meter in this case, multiply it by this number, and you come up with an annual estimate of the number of larvae that are lost due to entrainment.

Here is a result of the entrainment study. I won't go into the details, other than to say the vast majority of fish that were identified that were counted were unidentified gobies, 75 percent of the larval losses of fish were unidentified gobies, and 71 percent of inverts that were identified were brown crabs. Total numbers are around 500 million fish larvae per year, and about 13 million crab larvae per year. Other invertebrates were simply not counted.

And so we have no idea about the loss of other invertebrates or zooplankton or phytoplankton or algal spores or any of the other things that are not fish. All we have estimates for are crabs in the non-fish category.

There are really three methods to come up with an idea of what the impacts are to this loss. So you can say 526 million larvae, whoa, that's a big number. But you have to actually interpret that number in some way, and the three methods that have been used to interpret this number, the three general methods, are fecundity hind cast, adult equivalent loss, and the proportionate mortality or the empirical transport model.

If there are any questions about these two, I've got slides to cover them, but I'm not going to cover them today because we're really not concentrating on those two methods today. So I'm just going to pass by these two methods, and just come up with this next slide which says for fecundity hind casts, we need an estimate of the average fecundity, which is the number of babies a female produces. We also need an estimate of the mortality between reproduction and entrainment. And for most of the species that we're looking at today, and, indeed, for most species, we simply don't have that information. And so fecundity hind cast is not a very useful exercise here.

For adult equivalent loss, we need an estimate of mortality between entrainment and maturity for most species, and again, in this system we simply don't have that information. And so we can't use either of these two methods which have been used in other assessments.

Instead we were in some ways forced into the empirical transport model and to come up with a calculation of the rate of larval loss, which is called proportionate mortality. That is the key acronym, PM, proportionate mortality.

So how do we do this? Some of this is cut off, I'll just read them. You first determine the target species and you have to have the recognition that you can't do them all. There is a multitude of species out there, and many of them you can't identify in their larval form, and many of them are rare. So you can't calculate this estimate for all species.

You determine the period when the larvae are at risk. I'll tell you why that is important. And, in fact, that's a critical decision, or a critical estimation that needs to be made and has been made, and this is the source probably of the greatest source of discrepancy between our approach and what has been advocated by Duke.

You then calculate the rates of mortality for target species. You make the assumption that these target species that you can calculate the rates of mortality for are indicative of all those species that you can't calculate the rates of mortality for. Then you get an estimate for all those other species based upon the average of those.

And then that value represents the estimated rate of mortality for all species that have an open phase -- that is, a larval phase -- whose proportionate mortalities were not directly determined, and I'm going to go through this step by step.

So first, identification of target species. Which ones do you choose to work on, since we can't do them all? First and importantly, the ones that are commonly entrained, because for two reasons: one is they're probably the ones that suffer the most mortality; the second reason is numerically, mathematically it's a lot easier to work when you've got big numbers rather than lots of zeroes. And so for the models, this works out much better.

Those that are ecologically or economically important, so if they're a species of special interest, you might want to target those also. And again, this is the same thing, if there is a species of special interest, you'd want to target that species as well.

The second is determine the period when larvae are at risk. And I want everyone to pay attention to this, because this is really the crux of the argument, at least in large part. I've separated this larval period; that is the period when an individual is small enough or has life history characteristics that make it susceptible to entrainment, into three periods. There's this dark pink, a light pink, and a blue period.

The two pinks represent the period at which the species is at risk of entrainment. And that is developed empirically. Duke Energy, through their consultants, went out and sampled with considerable effort the entrained species that are coming into the plant. And they took them and they looked at the size and age frequencies of those individuals that were coming in -- an immense amount of work, and I really congratulate them. That was an immense amount of work, and I think that they did that very well. From that you can determine what size individuals and thereby what age individuals are actually taken into the plant.

So there is a group of individuals, a size and age group of individuals that are taken into the plant, and there is another group that I put in blue here, that could be taken into the plant because they're small enough, but they aren't. For whatever reason, they are not taken into the plant. Either they're not present or they have behaviors that keep them from going into the plant. And so we can define this as the periods at risk and not at risk.

We came up with two estimates as a working group for the period at risk. One is based upon the mean age of individuals that get sucked into the plant. That's in this category here, in the dark pink, which represents this fraction over here. We came up with a maximum age of individuals that are taken into the plant; that is, essentially what the oldest individual was that was taken into the plant that would constitute the maximum age by which an organism is at risk of entrainment, and that's in this column over here. And you can see that it varies a lot.

So for unidentified gobies, which were the vast majority of individuals which were taken into the plant, they have a larval period which is a period when, in theory, they could be sucked into the plant of between 90 and 120 days, so this is in some ways unknown.

The average age of an individual that was taken into the plant was 4.2 days, so very early, very young individuals were taken in there. The maximum age of individuals that were taken in the plant was 20.7 days. These two columns lead to direct or vastly different estimates of the loss rate of individuals. And so it's important that you see that there is a difference between these two, and I'll go into what the differences may be attributable to, and how they actually affect the model estimation.

So for shadow gobies, between 2.1 and 5.1. For the comb-tooth blennies, between 4 and 8, for staggering sculpins, it's between 15 and 25, and for the jack smelt, it's between 10 and 25 days, and so these are the two ends.

CHAIRMAN KEESE: Your dark pink or red, that's the average?

DR. RAIMONDI: That's the average.

CHAIRMAN KEESE: And --

DR. RAIMONDI: That's a mean.

CHAIRMAN KEESE: I'm sorry, the mean, and then the light is the maximum?

DR. RAIMONDI: Yes. And I'll show you how these things are calculated in just a second.

CHAIRMAN KEESE: Okay.

DR. RAIMONDI: Then you calculate the rates of mortality for the target species. You do this in this way. You estimate entrainment. We already showed you how to do that. You just count them up. You take the nets out, you get the concentrations, you multiply it by the amount of water going through the plant, voila, you've got the number that are actually taken into the plant.

Then you have to estimate the number that are at risk, you know, how many are at actual risk to entrainment. And that's the volume of water in the area of at risk times the concentration of the larvae. And then you get proportional entrainment.

How this was done is before, you estimate larval losses by just counting them, so we've already gone over that. How do you estimate the larvae at risk? Well, you have to define a source area at risk, and I'm just going to go over one of these, but for estuarian species, the ones that are most commonly entrained, the area of risk was Morro Bay. And from the opening into the depths of Morro Bay or into the far reaches of Morro Bay, and we used in our calculations four stations to estimate the abundance or the concentration, really, of larvae in Morro Bay.

We used the entrance, we used the intake, and two other stations that were located in Morro Bay. For coastal species, those that were actually produced on the open coast or in open waters, we used this station (indicating) and we used station five to estimate the number at risk. And so there were two --

HEARING OFFICER FAY: Could you describe where those are; since the transcript won't show your map, just indicate the last two stations.

DR. RAIMONDI: Okay. Station one is at the entrance to Morro Bay. Station two is at the intake. Station three is at the launch ramp, and station four is near the marina, off the marina.

Station five is, is it two miles, about? How far is it, off of from the entrance? Dave, two miles south of the -- three? Two to three miles south of Morro Rock, and that's an estimate of the open coast population.

Does that help?

HEARING OFFICER FAY: Yes, thank you.

DR. RAIMONDI: Okay. This is just a more detailed view of where they were taken in the entrance and out in front of the intake structure.

Then you just divide this number by this number, and you come up with an estimate of proportionate entrainment, which gives you an estimate of on a given period, a day, let's say, what fraction of the source population is being withdrawn and lost due to the operation of the power plant. So that is called PE and it's the first step to this, the number that we really want, which is the proportionate mortality.

And I'm just going to walk you through this, because this is the guts of the model. It's not very difficult, but it's the guts of the model and you can see why the mean versus the max is a really important determinant of the loss level.

So here is the calculation of the mortality rate, and they go through this in a little bit of detail. Let's say on day one there is a million larvae out there, and this is sort of the intuitive model. Let's say that daily loss due to entrainment, that PE rate is three percent. So that means on any given day, three percent of the larvae in the source population are actually lost due to the operation of the plant, only three percent.

Let's say that the days at risk, how long the larval forms are subject to risk is three days. The first day they're subjected when they're born, the second day after they're born they're at risk, the third day after birth they're at risk, fourth day, no longer; they're either gone or they have behaviors that keep them out of it.

So on the first day we started out with a million individuals. We take three percent due to the operation of the plant, which is 30,000, and so 30,000 larvae have been lost from the population. The second day, there's not a million anymore, there's 970,000 because 30,000 have been withdrawn. You take three percent of those, that's 29,100. Total withdrawal so far is the sum of these, which is 59,100. The third day you take another three percent. Now you're down to 940,000; 28,000 of those are taken.

The total withdrawal over those three days, the total entrainment losses, assuming 100 percent through plant mortality, is 87,327. Day four, they're not at risk anymore, and so now they're safe, they're not vulnerable anymore, and so the proportionate mortality is the summation of these values, divided by the number that were at risk to begin with, which is 87,327 divided by one million. So 87,327 were lost, there were a million to begin with. The total proportionate mortality for that species, for this time period, is 8.7 percent.

Yes?

CHAIRMAN KEESE: Your assumption, there is an assumption in here, then, that the only risk is entrainment. The only risk to these larvae is entrainment.

DR. RAIMONDI: No, I'm not making that assumption. What I'm trying to give evidence for is that the loss due to entrainment is 8.7. There could be 50 percent losses from other sources.

CHAIRMAN KEESE: Okay, but if -- and I don't know what, I have no idea what it is, but if you have a million larvae at day one, doesn't the natural cycle result in that being greatly diminished by day two?

DR. RAIMONDI: Yeah. We don't really know, but from all ecological theory they should go way down by day two. But that doesn't mean anything, that's not important. It's not that important. It's not important at all, actually, in terms of this calculation.

Because what this says is that if you have a million on day one and you take 30 -- let's say that the first things that are lost are due to the entrainment -- It just makes it easier. And so now you've got 970,000, and 470,000 of those died in natural processes overnight. And now the next day you've got 500,000. They're going to be taking another three percent of that 500,000 --

CHAIRMAN KEESE: Right, so you would be taking 15,000 instead of 29.

DR. RAIMONDI: Exactly, and we add it up. Let's just pretend that the number that you end up with down here is 40,000 or 30,000 instead of 87,327, right?

CHAIRMAN KEESE: Right.

DR. RAIMONDI: You would not then divide by a million. You would divide by the fraction, there would be a million here, and then there would be 500,000 here, and there would be 300,000 or whatever, and so you take the estimate of removing the natural losses and you would come up, we've done this, with exactly the same numbers, which means -- because a day one fish isn't worth as much as a day two fish --

CHAIRMAN KEESE: Got it.

DR. RAIMONDI: so they have to be compensated for it.

COMMISSIONER BOYD: This presumes a

static population of a million, but is there a replacement --

DR. RAIMONDI: Yes.

COMMISSIONER BOYD: -- over the season --

DR. RAIMONDI: Yes, absolutely. And so what has been done, and again, I have to give credit to these guys, they estimated this monthly. And so what happens is that you take the average, well, the weighted average of these monthly estimates and come up with an overall loss rate.

And so in some months it might be 50 percent. In other months it might be zero -- zero, zero, zero. And so you take the weighted average of that, and you come up, and I'll show you the numbers in just a second, with the best estimate over a year's period of what the proportionate losses were.

All right. Then what you do is you've calculated those for the target species, and then you have to come up with an estimate for those target species. And again, these have been cut off, but the numbers that are important are here. Bay species, estuarian species are designated in blue. Coastal species, those that produce larvae on the coast, are designed in white.

Let me go back, I need to go back one step first, and I just want to point out something. You can see here that we use three days at risk. If that same number, if that days at risk was ten days, it would just keep compounding, like interest. And so I want to point that out, because that is a major difference of opinion between Duke and us. And I think it's a valid difference of opinion and I'm not going to make any judgment at this point, but those two, the differences between the mean, which might be three in this case, and the max, which might be ten in this case, would really dramatically estimate -- change your estimates of the proportionate mortality, because it's like compound interest. It just keeps adding up over the days at risk.

So we have estimates of average period at risk, mean period at risk. We have estimates for maximum period at risk. We only have those estimates for the estuarian species for reasons that we can go into later, but it's not really important for our discussion.

If you look at the maximum period of

risk for bay species, only bay species, it's about 33 percent the proportionate mortality. And that means, simply, that on average, 33 percent of the larvae of these bay species are taken due to the entrainment of the power plant, if you use the maximum figure. If you use the mean figure, it's about 17.2 percent.

These are values that we use. We use 17 to 33, Duke uses a different approach, which is to combine coastal and bay species, and their range is between 10 and 33. Again, it's a difference of opinion about how to treat these things, and I'm sure that they'll discuss this. We think we have good reasons, they think they have good reasons. It's up to you guys to decide which are best.

And so we come up with these range -- Coastal species is about three percent, bay species is between 17 and 33 percent, and as I'll talk to you later, this is kind of a currency-less number here. And so we had to put it into some sort of currency that might make sense to both us, the laypeople, and to you guys.

COMMISSIONER BOYD: I guess I should reveal that I was an employee of the Department of Fish and Game once.

DR. RAIMONDI: Okay, all right.

So at the end of all this, the best -- in my opinion, the best estimate of mortality due to entrainment that's based on fish -- Remember, we're trying to estimate this for all taxa. We had the best information for fish, and so the best estimate of the rate of mortality or PM that is based on fish is 17 to 33 percent for bay species, and about three percent for coastal species.

Now, I want to go through some of the assumptions that were made, because the devil is in the details, and the detail is the assumptions, and this is where the discrepancy is going to be. The first assumption that was made was that there is 100 percent through-plant mortality due to entrainment, meaning every larvae that is taken into the plant comes out the other end dead.

The assumption of 100 percent through-plant mortality, we base this on there is no evidence for affected survival, and by affected survival I mean studies that have shown that once a larvae has exited the plant and is in the open water that it has a likelihood of survival.

There have been studies that have taken larvae out at the end of the pipe, brought them in the lab and found that they lived, and there have been other studies that have looked as much as possible at larvae that have been taken out of the end of the pipe and tried to follow them in the natural setting as much as possible. Those have generally indicated that there is massive mortality, even for those that do survive the end of the pipe.

The ones that have been taken out of the end of the pipe and brought back to the lab range in survivorship from high to low, depending upon the species. But overall, I don't think that there is any compelling evidence that suggests that there is affected survival in the wild for individuals that pass through. And this is an assumption that was agreed to by all parties, and it is an assumption that has been used at least in all recent California evaluations.

COMMISSIONER BOYD: Is there a high rate of observed predation at the end of that pipeline; i.e., is this a great feeding ground or has that been ever observed?

DR. RAIMONDI: I don't know whether this has been done for Morro Bay, and I think you guys may be able to address that, but for other discharges there is. Typically it's not, there's been no association made on it's larval discharge. There's a lot of stuff that comes out of the end of it and it's usually warm water, and so you get a difference suite of predators.

But, as an example, at San Onofre there is compelling evidence that there are more predators near the end of the pipe; whether they're feeding on larvae or what, we don't know. And so I don't want to make that association.

The second assumption, this is the heart of it: Use of the statistical means and maximums to estimate the period of exposure to entrainment. And there is another little sidebar, which is rather than the real maximums. So this is a common age frequency diagram that might have been produced from the data that Duke has collected.

What this says is if we look at all fish that have been entrained of a particular species, you might have a distribution of ages that look something like this. And there's graphs all over the place. They might not look like this, this is just for an example. And this adds up to a hundred, this whole histogram adds up to a hundred.

And so there are five percent of one-day-old fish, five percent of the fish are one day old, ten percent are two day old, 20 percent are three day old and so on. So if you look at all of these, that's all the fish. And they range in age from about one day to about 15 days, and this guy out here is really way outside. And so you think of this as perhaps being an outlyer and that becomes important later on.

Now I want to show you what is meant by these two methods of estimation, which is mean versus maximum. So if we look, this is the mean, the statistical mean is four-day-old fish. And if we use the mean, what that's saying is that the average age of the fish that is caught due to entrainment is four days old. And it basically assumes, in my opinion, that the rest of these fish are not susceptible to entrainment.

This is a difference of opinion and I think that they're going to have a response to this, but I just want to point out that this is, what this means is that the average fish is four days old, and that it's these fish and that period of exposure, four days, that is the susceptible period of exposure.

Here is the statistical maximum, out here at 11 days is the statistical maximum. And if we use the maximum, it says fish that are between zero and 11 days old are susceptible to entrainment and we should use the maximum. That's why we've given you the range. There is one value that's based upon the mean, there's one value that's based upon the statistical maximum.

There is a real maximum which is out here, and that we both have agreed, and this is an area of common assumption, that we don't think that this is an important value to use in the calculation of entrainment. Because these are statistical outlyers, and we agreed commonly to throw those out. And so the real discrepancy is between whether we use the mean value or the statistical maximum value.

Another assumption that we've made is that we use the average of the means and maximums period of risk of exposure rather than the maximum of the maximums. And I'll show you what this means. This is really fuzzy language, but what this means is very straightforward.

If we were -- We think it's between 17 and 33 percent, and that's based upon the average of these blue numbers here, which is 17, or the average of these blue numbers -- Well, pretend that's blue for now -- the average of those numbers there, which adds up to 33 percent. As Michael said before, there are some species for which the risk is lower, and some for which the risk is higher.

If we believed that these numbers were hard and fast, meaning that they were perfectly accurate, and we wanted to recoup all the losses that were due to the operation of the power plant, 33 percent does not capture the loss rate of comb-tooth blennies. Seventy-two percent does. And so you could argue that 72 percent is really the value that should be used, because that is the maximum risk to the species at maximum exposure, 72 percent.

Again, I'm just going to speak for myself here. I don't think that that's right. I think that the best estimate is 33 percent, and the reason for that is, is because I think that all these numbers have error around them and we're using each of these numbers as an estimate of the risk of exposure. No one number I think is a very valuable or valid number, but I think in sum total they give a good estimate of what the risk of exposure is, and it's somewhere between 72 and 33 percent.

There is no accounting for compensatory mortality. This may come up, it probably will come up, and all I'm going to do is discuss what is meant by compensatory mortality in this context so that you can understand it, in case it does come up.

Michael just asked me whether I could discuss also how these assumptions increase or decrease the estimate of mortality losses, so I'll just go through one. A hundred percent through-plant mortality, if you reduce that to 50 percent or 60 percent, obviously the loss rate will go down. And so 100 percent mortality maximizes the estimate of proportionate mortality.

The use of statistical mean versus maximum: Maximum is going to give you the highest estimate of proportional mortality -- not the highest, it's going to give you what I think is the most valid highest estimate, the real mean gives you the highest. The mean will give you an intermediate level of mortality, and so it's the difference between the mean and the maximum.

The use of the average of the means, that's going to decrease the mortality rather than using the maximum, the 72 percent. And compensatory mortality, we've assumed that there is no compensatory mortality in the system. More importantly, I think that what we're assuming is that we can't account for it. And so I'm not even sure that we're assuming there is no compensatory mortality, I think a better approach to what we've been saying and what we've been assuming is there is no way to estimate what it is, if it's there at all.

And if you assume no compensatory mortality, that's going to elevate the estimates. If you assume compensatory mortality as I'll show you later, it's going to decrease the estimates of the rate of loss.

All right. Here is compensation, and, again, this line up here (indicating) is pure us, and so I want to point that out. This is not, I think, an agreement by Duke, massive uncertainties. Just look at this graph, forget the arrows for the time being. If you have a certain number of larvae -- You can make up any number you want, let's say there's a million larvae -- you have a larval abundance, and from those larvae adults are going to arise, because they grow up and they become adults.

This is the adult population on this axis, the Y axis; here is the larval population on the X axis. The typical relationship that's been advocated between -- under compensation -- between the larvae and adult numbers is something that looks like this. As you increase larvae, going in this direction, adult population should go up, but they shouldn't go up indefinitely. They should go up to a carrying capacity of some sort, a threshold capacity indicated here.

And after that point, further increases in larvae make no further contribution to the adult population. And so you have this characteristic increase and then flattening region.

The argument about compensatory mortality really revolves around one major thing, where you start from, over here. So, as an example, let's say you start over here with this many larvae and you reduce that larval population by 33 percent, you don't change the adult population whatsoever. And you could make an argument, though I don't think it's a sound argument, that 33 percent loss doesn't have any important ecological impacts. I think the argument might be made that it doesn't have any impacts on the adult populations, but I think the impacts would still be important ecologically.

But you could make a strong argument that the adult population doesn't change when you reduce larval population by 33 percent, if you start it over there. On the other hand, if you start over here, let's say at 500,000 and you move at 33 percent, now what happens is this adult population, this many larvae turn into this many adults, and you move over here, this many larvae turn into this many adults, you have a direct consequence to the adult population, and it's proportionate. It would be 33 percent or almost 33 percent decrease in this particular case.

The question is where do we start? In my opinion, we have no idea where we start. And so we don't know whether we're starting over here, we don't know whether we're starting over here, we don't know whether we're starting over here, we don't know whether we're starting over there. And so based upon this, in our opinion, and I'm sure there's going to be a dispute about this, there is no basis for invoking compensation when you have no idea where you are along the X axis.

CHAIRMAN KEESE: Is that an inability to determine the carrying capacity?

DR. RAIMONDI: It's in part due to the inability to determine the carrying capacity, but it's also because we haven't had the long-term day that we would need to see whether there is, in fact, a constant carrying capacity. These things may jump up and down dramatically over time. It assumes some sort of equilibrial population or at least a modeled equilibrial population over time. We simply don't have any information about that in these systems.

CHAIRMAN KEESE: So you don't -- In the estuary you don't have any idea what gobies, let's --

DR. RAIMONDI: What the number of gobies are?

CHAIRMAN KEESE: What the concentration of the goby --

DR. RAIMONDI: The best estimates we have for Morro Bay are larvae. We have really good estimates for larvae. We have very poor estimates for adults. And we certainly don't have long-term estimates for adults, which would allow you to follow where there's a constant number of adults over time, which is what you'd sort of expect if there was a carrying capacity, or at least a predictable number of adults over time. We don't have that information.

COMMISSIONER BOYD: Is there agreement on the concept of a carrying capacity versus there just being a linear relationship?

DR. RAIMONDI: I think -- I'm speaking off the record, I mean, not off the record but I'm speaking for myself now, not for staff and not for anybody else, the technical working group -- I think that there is no well-recognized idea that there in many habitats should be a carrying capacity that is based upon habitat for adults.

And so if you have a limited amount of habitat for adults, clearly you're not going to have 50 billion adults out there because they'd be up on the shores. And so there is some threshold that's based upon the amount of habitat that's available for adults.

However, it hasn't been clearly delineated in almost any real system that there is a constant carrying capacity. This has been the basis of fisheries models up until very recently. Not all have led to collapse, but many have led to collapse. The species on the West Coast are uniformly in collapse.

And so I think that this model works. It has to work at some level. I think we have simply too limited information to use it in an effective way. Again, now I can come back to the technical working group. That's my personal opinion.

HEARING OFFICER FAY: One thing I want to point out, and this is by way of background, and Dr. Raimondi and Michael Thomas will be sponsoring the staff's report to the Water Board. So we'll have another chance to get into their particular views.

How much longer --

DR. RAIMONDI: I've got maybe one slide, two slides.

HEARING OFFICER FAY: Okay.

DR. RAIMONDI: Did you want to say something?

MR. THOMAS: Yeah. I just wanted to add something, and you can correct me if I'm wrong here, but this is a fundamental slide that Dr. Raimondi has up here. You could draw one of these curves for any species. And the power plant entrains hundreds of species.

As Dr. Raimondi said, we don't know where we are on this line for any particular species, and the things that are going on in the estuary, like sedimentation and pollution and dredging and all these different impacts that are occurring on the estuary and the populations within the estuary would act to push us in this direction, towards a decline. Those are impacts that are occurring. They're different things that are causing degradation to the estuary.

We know that they exist. We can't quantify them. So this is a major difference in how we look at this information as compared to how others are looking at it.

MR. ELLISON: Would it be permissible for me to just ask a question here?

MR. THOMAS: Sure.

MR. ELLISON: Is that fair enough, on this point?

Michael, let me ask you this. I want to make sure I understood what you just said. You were referring to dredging, sedimentation, pollution, those kinds of things. I understand that those things would affect the habitat available to the species. And assuming that that's true, I understood Pete to say that the carrying capacity was largely a function of how much habitat is available.

If I'm wrong, you'll have your time, okay, I just want to --

MR. THOMAS: Sure.

MR. ELLISON: Here is my question. If you reduce the habitat through sedimentation, through pollution, through dredging, are you not reducing the carrying capacity? As opposed to moving to the left on this graph, aren't you, in fact, moving the red line down, if you will, and therefore in effect moving to the right?

DR. RAIMONDI: Can I answer?

MR. ELLISON: Yeah, please.

DR. RAIMONDI: I didn't know whether this was after -- That's right. I mean, it depends and, as I said before, the models that have been used for compensatory mortality are largely based upon the idea of for these type of fish, not for oceanic fish, for these type of fish that habitat is a major limiting factor. We don't know that. I mean, this is the model.

Number two: The same sorts of things that would reduce habitat might also and have been shown also to decrease larval performance, and so pollutants coming into the estuary could really nail larval populations. Larval populations are far more susceptible to toxins than, say, are adults.

And so you might be moving to pollution or toxins or agricultural runoff, and the larval number is way to the left just due to ordinary events that occur in modern-day Morro Bay. And then further reduction, due to the operation of the power plant, could really cause these things to shift.

I'm not saying that this is what's happening, I'm saying we just don't know. I mean, I think that's the bottom line. We simply don't know. And so we've opted, as an approach, to be very conservative in this, and we have a difference of opinion.

MR. ELLISON: Okay.

HEARING OFFICER FAY: What I had told Mr. Ellison is that they would be able to point out any things where they thought things went beyond neutrality. If you're done with your overview, then Duke can do that briefly now or just include it in their direct --

DR. RAIMONDI: I have a couple more slides.

HEARING OFFICER FAY: Two more slides? Okay, all right.

DR. RAIMONDI: If that's all right.

HEARING OFFICER FAY: Sure, go ahead.

DR. RAIMONDI: All right. So I'm going to pass on compensation, the rest of compensation, other than to say that we think that there is not a basis for it in this particular system.

So we get back to this, and these are my two more slides. One is the rate of mortality due to entrainment, we say that the best estimate is between 17 to 33 percent for bay species; for coastal species, three percent. Duke is going to have a different approach to it. I think that theirs is going to be somewhere between nine and 33, and they're probably going to opt for the nine and we're going to opt for the -- we think it's 33 percent. But it's a difference of opinion.

What does this mean? And here is the

thing that I want to do, and I'm not -- and I want to make sure that everyone realizes that the next slide I put up is not an advocation for any particular mitigation approach, it is not. But I think that these numbers here, 17 to 33 and three percent, are very misleading. They have no units associated with them.

And what I want to put this in is a currency that I think everyone can understand, what it means to lose the production of 17 to 33 percent or three percent. This isn't to say that habitat is being lost, it's to say that production from habitat is being lost.

And so if you convert this into the amount of production that has been lost from these systems, this represents, the 17 to 33 percent of Morro Bay means that the production, the larval, the propagule production from between 380 and 760 acres has been lost. I want to be very clear that I do not mean habitat has been lost. I mean nothing like that. But the larval production, based upon these numbers that have been calculated by the technical working group, translate into a loss of production from about 17 to 33 percent of Morro Bay, which is 380 to 760 acres, and it's three percent of the number.

The real reason that I put this up there is because everyone thinks three percent, no big deal. Three percent, for the coastal species, represents somewhere between two and four linear miles of coastline, so there has been loss of larval production, propagule production from between two and four miles of the coastline following the numbers that were presented in the 316(b) report. And so in those -- I wanted to give the currency, which is area of lost production.

Michael just wanted me to clarify that, which means -- and what I mean by that is that it would take two to four miles of coastline to produce the larvae that were lost due to entrainment, the coastal larvae that were due to entrainment. At that, I'm done.

HEARING OFFICER FAY: Okay. Thank you very much. That was very informative.

Mr. Ellison, do you want to just address this in your direct?

MR. ELLISON: Well, yes, basically, but let me just make one small statement and then also ask Dr. Raimondi and Mr. Thomas sort of one sort of global question.

The small statement is let me first of all say that Duke absolutely agrees with Dr. Raimondi's statement that these are honest differences of opinion, where we do have differences of opinion. There is an awful lot of agreement, I think, amongst the technical working group, and the technical working group has worked well.

We want to commend all of the members of the technical working group for all the hard work that they've put in. And again, we agree that where there are differences, they are honest differences of opinion and we can get into that in a minute. They are significant, you get pretty different answers.

The other thing I'd like to do, Dr. Raimondi, is could you go back to the slide, I confess I've forgotten what the title of it was, but it was the one that sort of listed what I would -- 100 percent mortality, the low compensation --

DR. RAIMONDI: The assumptions one?

MR. ELLISON: The assumptions slide, right, assumptions.

DR. RAIMONDI: That one?

MR. ELLISON: Yes, that one. Now, in each of these cases, as I heard your presentation, you were saying that an argument could be made around each of these issues.

Is it fair to say that in order to provide safety margin against some of the unknowns that we have in doing this kind of analysis, that you are recommending taking the most conservative of the assumptions, or at least the most reasonable conservative in each of these cases?

DR. RAIMONDI: Now?

MR. ELLISON: Yes.

DR. RAIMONDI: No. But not far from it. I think that that's in order. I think the 100 percent through-plant mortality is the most conservative. In my opinion, it's the most reasonable. So in every case, you can just assume that I think this is the most reasonable, so I won't say that every time.

For the means and the max and the real max, we -- I think that the maximum value is the most appropriate one. It is not the most conservative one. The most conservative one would be use the real max. But I agree with the work that's been done that indicates the real max probably isn't an appropriate measure to use. And so we're sort of in between there, tending on the side of conservation.

The use of the average versus the maximum value, the 73 versus the 33 percent, I think that is the appropriate but it is certainly not the most conservative. The most conservative would be to use 73 percent.

Compensatory mortality? Absolutely. You're absolutely right there. We just do not account for it at all, and that is absolutely a conservative estimate.

MR. ELLISON: The point that I'm trying to get to is that you have -- Let me put it this way. On both sides, the technical working group has agreed and Duke has agreed in a number of cases to make conservative assumptions to provide a safety margin against lack of data and that sort of thing; is that a fair statement?

DR. RAIMONDI: In some cases, yes, I think that's a fair statement.

MR. ELLISON: Okay. And would it be fair to say, then, that to the extent there are disagreements, that they are largely around how much additional safety margin ought to be built in?

DR. RAIMONDI: Not always. I think that the -- I'll give you one case in example. I think that the difference in approach for the use of the means versus the maximums is a fundamental difference, and it is not about conservation. I simply think that the maximum makes sense. It's the appropriate one, it's mathematically right, it's ecologically right.

MR. ELLISON: Okay. Fair enough. We'll get into that later.

The point I'm trying to across is would you agree that there has been an effort by the technical working group to build in safety margins to make conservative assumptions to allow for some of the unknowns, and that there has been agreement in several places to do that. And that the disagreements that we have are on top of those agreements?

DR. RAIMONDI: Yeah, I -- Michael just leaned over to me and I am in agreement with him, and so I think in most cases the possible exception is 100 percent through-plant mortality, we've just agreed to what we think is the most reasonable assumptions to make.

And I have to say, you know, in the technical working group there wasn't a discussion ever that I can recall about we need to err on the side of conservation here. We went into this with the idea that, well, this seems like a reasonable assumption, this seems like a reasonable assumption.

Well, 100 percent through-plant mortality, we went into it knowing that there were examples, cases where there has been evidence, laboratory evidence -- at least to my knowledge, and maybe they'll present other information today, but laboratory evidence that there was the potential for survivorship. And in that one case, we made the conservative assumption that since we didn't know what was going on, there was this level of uncertainty about performance in the field, we ought to opt for 100 percent mortality.

MR. ELLISON: Okay. Well, we'll get into it later.

MR. NAFICY: Mr. Fay, I would like an opportunity also to I guess express a fundamental disagreement with something that was just said, which I feel went beyond neutrality.

HEARING OFFICER FAY: Yes, if you can keep it brief.

MR. NAFICY: I will.

HEARING OFFICER FAY: Okay.

MR. NAFICY: Okay. Can you go to the last slide you had, please?

DR. RAIMONDI: The very last one?

MR. NAFICY: Very last one.

DR. RAIMONDI: Sure.

MR. NAFICY: I think we were together for much of the way. Now, I think, just for starters, this is a not-too-subtle nudge toward a certain mitigation approach. I'm not saying that this wasn't necessarily your intent, but this certainly -- if you buy into this formula, it certainly is a lot easier to buy into a certain mitigation approach that has been advocated by both Mr. Raimondi and Regional Board staff.

So, to the extent that it is presented as a, quote, mutual way of translating the losses into a currency that is understandable, left it that we fundamentally disagree that this is a necessarily inappropriate approach for understanding the significance of entrainment losses.

I think there are other ways, perhaps more telling and valid ways of trying to capture the significance of this impact, rather than assuming, for example, that habitat is a limiting factor for production. I mean, I think that you can look at it a lot of ways. What are the other stressors? What is the impact on the most, the rarest and the most sensitive species?

But none of that has been done. And so we think that this really doesn't add anything to the 17 to 33 percent, knowing that it represents, those figures represent a certain percentage of the total acreage of the bay.

HEARING OFFICER FAY: Mr. Naficy, I'm going to stop you there. Your objection is noted, and I think you may want to have your witness on direct point out the shortcomings that you see in it.

What we wanted to do was get a foundation so we're all a little bit smarter on how you look at impacts to an estuary. And I'm anxious to get into our taking of formal testimony.

So I want to thank the Water Board --

DR. RAIMONDI: Can I just make one

response? I just want to say up front that --

HEARING OFFICER FAY: As long as it's not rebuttal. We don't want to get into that.

DR. RAIMONDI: No, all I want to say is that in this technical working group, I think none of us, as a scientist on the Duke side or on our side, has ever said anything about preferred option for mitigation.

And so we stopped really at these numbers, and we made no --

HEARING OFFICER FAY: And there may be a number of different ways to display opinions of equivalency, and I'm sure parties will offer that if they feel that way.

CHAIRMAN KEESE: Commissioner, I just want to ask some basic questions from my experience. You know, forests will only handle so many deer, and if you take away the predators, the deer population will stabilize, whether they eat the small deer or not.

I happen to be from an area up in the mountains where, you know, they've put the pike in the lake, Lake Davis. And you can put all the trout you want in that lake, but the pike have, the female pike lay 10,000 eggs apiece at maturity. And we're not going to get millions of pike in that lake.

But using that as my experience, are we talking about something significantly different than my experience would be when we're talking about an estuary? I mean, is there -- Are we talking about two totally different things here?

It seems to me a pond or a forest is self-limiting, to a large extent. And that's why I would tend to say, you know, there are only so many fish you're going to put in a defined pond. There are probably, I would guess, only so many fish that are going to live in an estuary.

DR. RAIMONDI: May I respond?

HEARING OFFICER FAY: Okay.

DR. RAIMONDI: I'm not going to use the pike example, because that's sort of an artificial introduction, but the deer example, I think, is revealing. And essentially, the argument here would boil down to, you know, let's say that deer produce many more baby fawns than can be supported as adults in the population. Are those wasted resources or are they utilized by some other component of the ecosystem?

And it really fundamentally gets to the

main issue here, and that is taking the approach that the only thing that one should be interested in is the adult stock of the same species. You could make an argument that there is no compelling evidence that the loss of larval gobies is going to change fundamentally the adult number of adult gobies in Morro Bay. You could make that argument. I don't think we have enough information to say anything very revealing about that, because we don't measure gobies like we measure deer. We don't have that information.

You could make that argument, but it completely misses what I think is a more compelling argument, which is those are resources that are utilized in other ways in the system. They are also importantly a buffer against uncertainty in the system. And so on any given year, there may be overproduction of larvae, you know, if you think about it in those terms. Even though those other larvae are being used by other resources.

But on bad years, they may be essential. And the power plant doesn't distinguish between good and bad years. On bad years, it takes 33 percent and on good years it takes 33 percent.

And so you can think of this, at least the way I think about this, is an ecological buffer against uncertainty that is true especially in marine systems because they fluctuate so dramatically, the environmental quality. And if we come into another system, things may change very dramatically.

And so I just don't think that there is enough information by which to say, you know, they're just wasted resources.

MR. ELLISON: Mr. Fay, let me suggest that this is getting beyond neutrality, and I'm not criticizing you, but I think we're getting into issues here pretty seriously. And I think it would be probably best if we got into the taking of testimony and we can explore these issues in that way.

HEARING OFFICER FAY: Thank you. So if Duke is prepared now, we will begin with the presentation of your direct evidence on aquatic biology impacts.

MR. ELLISON: We are prepared. We have a panel which I would call to the stand consisting of Dr. David Mayer, Dr. James Cowan, Brian Waters, John Steinbeck, Dr. David Jay, and Mr. Robert

Cochran. Mr. Cochran has -- The rest of the panel is up here. Mr. Cochran sponsored a small portion of our rebuttal testimony, and he's here in the audience. And I would ask that all of the members of the panel be sworn.

THE REPORTER: Please stand.

Whereupon,

DAVID MAYER, JAMES COWAN, BRIAN WATERS,
JOHN STEINBECK, DAVID JAY, and ROBERT COCHRAN,

Were called as witnesses herein and, after first being duly sworn, were examined and testified as follows:

THE REPORTER: Please proceed, counsel.

MR. ELLISON: I'll address my questions to Dr. Mayer as the lead of the panel.

DIRECT EXAMINATION

BY MR. ELLISON:

Q Dr. Mayer, do you have a copy of Duke's aquatic biological resources testimony filed on May 13th?

A I do.

Q And do you also have a copy of Duke's rebuttal testimony on aquatic biological resources?

A I do.

Q With respect to the rebuttal testimony --

MR. ELLISON: Okay, I actually have a technical exhibit number issue, so let me just say that the issue is that Duke's rebuttal testimony is composed in such a way that what we've been doing is numbering it separately by topic, but it's actually composed as a single document. And I think we may have an issue of parties not being sure which portions of that document belong to which exhibit number.

CHAIRMAN KEESE: I think Mr. Fay will be back in two minutes, so --

MR. ELLISON: Okay. So what I'm going to propose --

(Loud microphone buzzing.)

MR. ELLISON: What I'm going to propose in a minute is that we give that rebuttal testimony a single exhibit number, and since it has already -- it was first identified as exhibit 200 for terrestrial. What I'm going to propose is that we identify it as exhibit 200 for all of Duke's rebuttal testimony, which will leave a blank -- We've identified it also for alt cooling as exhibit 229. I'll go into this with

Mr. Fay.

CHAIRMAN KEESE: Okay.

BY MR. ELLISON:

Q In any event, Dr. Mayer, do you have a copy, well, actually, Duke's direct testimony needs the next exhibit number in order.

MR. ELLISON: Do you know, Mr. Okurowski, what number that would be?

MR. OKUROWSKI: I do. That would be number 266.

MR. ELLISON: Okay. Pending Mr. Fay's return, we will refer to this as 266.

BY MR. ELLISON:

Q Dr. Mayer, do you have a copy of exhibit 266, the direct testimony, and a copy of exhibit 200, Duke's rebuttal testimony?

A I do.

Q And were these prepared by you or at your direction with respect to aquatic biological resources?

A They were.

Q And do they contain the qualifications of the members of the panel?

A They do.

MR. ELLISON: I would like each of the

members of the panel to briefly state your qualifications. State and spell your name for the record first, and then briefly give a statement of your qualifications, starting with Dr. Mayer.

DR. MAYER: My name is Dr. Mayer, I'm president of Tenera Environmental. We're located in San Francisco and San Luis Obispo offices. I received a bachelor of science degree from San Jose State University and completed and taught courses in marine biological sciences at Moss Landing Marine Laboratories before continuing at the University of Washington, where I received a PhD in fishery science.

I've had approximately 30 years' worth of experience, both local, along California's coast, in looking at the effects of cooling water systems, primarily from once-through cooling water power plants located on the coast, as well as other inland and freshwater biological studies. Some of the sites that I've looked at in particular include Diablo Canyon, Moss Landing, Morro Bay, and the Potrero power plants, where I worked as a lead scientist on those studies.

I've also testified before the Regional Water Quality Control Board on various matters related to these studies. And I've also provided expert witness on power plant projects as part of the California Energy Commission's application for certification. I've also continuing involvement in studies of the Sacramento/San Joaquin Bay Estuary, working with the interagency ecological program.

DR. COWAN: My name is James Cowan, C-o-w-a-n. I'm on the faculty in the department of oceanography and coastal sciences at the Coastal Fisheries Institute at the Louisiana State University. I have graduate degrees in biological oceanography, experimental statistics, and a PhD in marine sciences from Louisiana State University.

I currently am chairman of the Refish Dock Assessment Panel, and a member of the Standing Scientific and Statistical Committee for the Gulf of Mexico Fishery Management Council. I have served as president of the air life history section, and on the outstanding chapter award and distinguished service award committees for the American Fishery Society.

I have almost 20 years of experience conducting fisheries research in marine and estuarian ecosystems on all US coasts, including the west coast in California. And I've authored more than 70 refereed publications in the primary fisheries literature. I've also served four years as an associate editor for Estuaries, which is the journal of the Estuarian Research Federation, and am currently associate editor for the Transactions in the American Fisheries Society and for Gulf of Mexico Science.

DR. JAY: I'm David Jay. That's J-a-y. I'm an associate professor at the Oregon Health and Science University in the department of environmental science and engineering. I have a masters degree in marine environmental studies from Stoneybrook University and a PhD in physical oceanography from the University of Washington.

I have almost 30 years' experience working in estuarian research, including the areas of circulation, sediment transport, climate or hydrological impacts, estuarian ecosystem processes, estuarian classification and comparison. I've been consulted by quite a number of agencies and tribes and private organizations.

I've worked in quite a number of estuaries throughout temperate North America, although most of my experience is on the west coast of the United States. I have been twice on National Science Foundation review panels in oceanography and land marsh and ecosystem research.

I have more than 30 publications since I obtained my PhD in 1987.

MR. STEINBECK: My name is John Steinbeck. I'm the vice president of Tenera Environmental. I've over 20 years of experience as a professional environmental scientist. I have a masters degree from California Polytechnic University in San Luis Obispo. I've been involved in the design, management, sampling and analysis of several studies on the effects of power plant cooling water intake systems over the past several years, including the ones here at Morro Bay, Moss Landing, Diablo Canyon, and Potrero power plants.

On these studies and on the study of Morro Bay, I was responsible for the data management and analysis and assisted in the management of the projects, and also all the report preparation.

MR. WATERS: I'm Brian Waters, Brian spelled with an i, Waters spelled with one t.

I'll try to keep it short. I testified before this group before.

I have a bachelors degree in fisheries from Humboldt State University, a masters degree in fisheries from University of Washington. I have over 30 years of experience working on energy and major water resource projects, principally in California but also in other parts of the United States.

And among other professional activities, I have served in the elected position as president of the California/Nevada chapter of the American Fisheries Society and as director of the American Institute of Fishery Research Biologist.

MR. ELLISON: Mr. Cochran, if you'll forgive me, we're going to skip your qualifications since you've previously testified.

BY MR. ELLISON:

Q Dr. Mayer, do you have any additions, corrections or clarifications that you'd like to make to either exhibit 266 or to the aquatic biological resources portion of Duke's rebuttal testimony?

HEARING OFFICER FAY: Let me break in there. I apologize for not being present when you addressed those others.

I would like each of the rebuttal documents to be identified with a separate exhibit number so that, for instance, Duke's rebuttal to Peter Raimondi or Duke's rebuttal to one of the CAPE witnesses can be handled separately. Since they're paginated separately, I think it would help to have them identified separately.

MR. ELLISON: Okay. Tell you know, while we're taking time now, we will attempt to do that. There may be some issues of clarity around that, and we'll talk to you about it if there are.

HEARING OFFICER FAY: Okay.

BY MR. ELLISON:

Q Anyway, do you have any additions or corrections you would like to make, Dr. Mayer?

A No, I don't.

Q Dr. Mayer, is the testimony that you're sponsoring or the facts contained therein true, to the best of your knowledge?

A They are.

Q And do the opinions represent your best professional judgment?

A They do.

Q Do you adopt it as your testimony in

this proceeding?

A I do.

Q Could you -- We have a summary of Duke's testimony on this model. Would you proceed, please.

A I've prepared a brief summary and I'll proceed with that now.

All right. I"m technically equipped here. In my testimony today I'll summarize the Morro Bay power plant modernization project, and looking at this in an overview, I'm going to talk about the location, description, the cooling water system improvements, key laws that apply to cooling water systems, the setting of the project, and cooling water system effects.

The Morro Bay power plant has been operating near the entrance of Morro Bay alongside the City's other ocean-related industries for nearly half a century. Over this period of time the power plant has been operating taking seawater, up to 670 million gallons per day, from the harbor area, and, after running it through the power plant to condense steam, return it to Estero Bay as warm water discharge northeast of Morro Rock.

I do want to at this time appreciate Michael Thomas and Pete Raimondi for building some of the foundation, so there were some topics that I was prepared to talk about, the work that was done with the technical working group, and I think they've done a good job of outlining that work.

What is changing about the modernization project? The modernized facilities intake system will use smaller cooling water pumps, vary the pumping rates under plant operating needs, and the use of the smaller pumps not only means that all the pumps when they're operating, 29 percent fewer organisms are entrained, but the discharge volume and any thermal discharge effects are similarly reduced.

Lower intake flows mean lower velocities and fewer organisms screened and transported to Estero Bay. On this slide is displayed both the existing condition of the power plant intake flow. Six hundred and sixty-eight represents their installed pumps with the wear factor built into it. The modernized facility will use 475 million gallons per day with the smaller pumps I referred to. The difference between these two is 29 percent.

Looking at it under the conditions of maximum annual daily average permitted, existing is 725 million gallons per day; the modernized facility will use 370, as agreed to by Duke under a capping of these flows. This represents a change of 49 percent. In either case, the reduced flows are worthy of minimizing adverse effects of the intake.

What are the key laws that apply to these changes? The California Environmental Quality Act requires that the alternatives considered, if the project's water usage exceeds the base line condition, is without impact. Duke has agreed to accept the permit condition that will limit average annual daily flows for the new facility to 370 million gallons per day that I showed in the previous slide, which is lower than the base line condition of the existing facility. Under CEQA, there will therefore be no significant impacts.

Section 316(b) of the federal Clean Water Act requires that cooling water structures incorporate the best technology available, BTA as it's referred to, to minimize any environmental impacts. The 316(b) is a narrative standard based on an assessment of intake effects and site-specific feasibility and effectiveness of alternative technologies.

The EPA draft 316(b) regulations recently released for existing facilities state, "Under today's preferred option, restoration measures can be implemented by a facility in lieu of or in combination with reductions in entrainment and impingement mortality. EPA in its draft regulation also recognized that a perfect nexus cannot be expected in many cases, and that habitat restoration may be appropriate for a full, without a full understanding of the requirements of organisms in the enhanced environment.

Even so, we think we can show a very clear connection to plant effects through habitat restoration. We have deferred those discussions until a later proceeding.

Over the past five decades, the power plant has consistently operated safely, within the compliance of its water quality permit, requiring protection of the fish, shellfish, and wildlife of the Morro Bay and Estero Bay, coupled with no evidence of negative biological effects over that period.

If, as some has suggested, power plant entrainment is reducing the productivity, and I said productivity of Morro Bay by 33 percent per year, the bay would have been emptied of its marine life many years ago.

If you are a Morro Bay fish larvae, the risk of being entrains goes up, as we've heard earlier, the longer you stay as a larvae in Morro Bay; in other words, it's a time-dependent function of your risk to being entrained. Morro Bay is not a closed system such as a lake, and its water currents, which vary with the size and shape of the bay, control the number of days fish larvae remain in the bay at risk to entrainment.

What I'm showing you here is a map, lots of color. It's actually indicating salinity. And I call it the lower-upper end of the bay, but it's actually north-south-lower. This is the entrance to the harbor, and at the very top, not clearly shown here, is the location of the power plant intake. What is showing here is that as fresh water comes in to the bay through Los Osos or Chorro Creek, it mixes in this back bay area and moves into the entrance, which then is countered by incoming seawater combined to make new salinity patterns.

HEARING OFFICER FAY: Excuse me, Dr. Mayer, that is identified as number six of your Powerpoint, and did you want this identified as well as an exhibit, the packet of the Powerpoint presentations? We'll be sure to make a note on that, and --

DR. MAYER: Okay.

HEARING OFFICER FAY: Yeah. I'm sorry to interrupt you. Go ahead.

DR. MAYER: In some other foundation discussions by Dr. Raimondi and Mr. Thomas, we learned that nearly 80 percent of the fish larvae that are entrained by the power plant up here are gobies. The goby habitat in Morro Bay is located in this back bay region. This is an area of very, very shallow mud flat areas where we believe to be, is the preferred habitat of the goby, producing the larvae that are entrained most commonly by the power plant at this end of the bay.

Narrow channels characterize the lower end of the bay, broad shallow expanses the upper end of the bay, commonly supporting eel grass beds and currently areas of very large mud flat habitat.

What I want to show you now is, we'll start the -- this is a model which was created by the Morro Bay National Estuaries Program, and it's a model that indicates the flushing action of the bay, using salinity as a surrogate for movement of particles or other materials in Morro Bay.

What we can see shown in red is the open ocean seawater moving into Morro Bay at the entrance, and mixing. What we're watching is this, over a tidal cycle of a 48-hour period, so it's going from high and low, and you'll see the water moving in and out of the bay. The dark red area, of course, as I've indicated, is the seawater. We've seen these boundary areas where mixing is occurring with the freshwater in the back part of the bay.

What I'd like you to watch is that the point of the intake, and also this back bay area, the point of the intake, the power plant is characterized by a wide change and rapid change in the colors, which is indicating water masses moving in and out of the bay. The back bay area stays this light blue or purplish color for lengthy periods of time. The contrast is that down in this portion of the bay, there is a very little chance of staying in that location for extended periods of times, as compared to this back area of the bay.

The next slide will show you that if we take the results of this model and we boil it down into an indication of how long you might expect to stay in any location in the bay, you can see there is a great deal of difference -- These are in days, I've superimposed that on this rather poor copy of the map -- this indicates the number of days that it would take for half the concentration of salinity in this case to change; in other words, reduce the salinity by 50 percent.

This rate of flushing can be applied in general to the idea that particles are also flushed in and out of the bay at the same time. There is not an exact relationship here, I'm not suggesting there is, but this is a strong indication that these back areas of the bay with weak tidal currents are areas that have long periods of residence. The area of the intake, where I've indicated here, have very short periods of residence time in the order of once, two days, as compared to these back areas of up to 15 days.

This may be very significant to larval fish in that it allows them time to wear in the back portion of the bay. The other aspect of this is as soon as they are transported, one way or the other, into the lower portion of the bay, their chances of staying in the presence of the power plant or subject to the risk of entrainment is a very short period of time, on the order of one to two days. Again, we will talk about that more and Dr. Cowan will have some specific thoughts on comparing the vulnerability and the susceptibility of larvae to entrainment, based on this kind of information.

What I'd like to say at this point, if I was a Morro Bay fish larvae, no matter how old I am or how many days I spent in the back bay, if I am at risk to entrainment and if I move down to this lower portion of the bay, I'm at a risk for entrainment for only one to two days. And the tidal currents in that intake area in that sense create a natural protection against being entrained, because I'm being transported rapidly out of that area, so my exposure to entrainment is naturally capped by the tidal flushing in that area.

The slowly flushed back areas may be very important for nursery areas, but the trouble at this present time is they're also susceptible to sedimentation, which is one of the losses that we're experiencing in the bay in terms of its quality and habitat.

What are, then, some of the problems of the bay at this time? Morro Bay suffers from a number of problems that are not related to the Morro Bay power plant. Since 1995, Morro Bay's estuary program, in conjunction with a group of citizens, scientists and other government specialists, have been studying the problems facing the Morro Bay estuary and its water shed.

Their findings, published in the National Estuary Program's comprehensive conservation management plan identified the following priority problems: sedimentation, bacterial concentrations, nutrient concentrations, buildups, heavy metals and toxics, habitat loss through sedimentation primarily, and steelhead loss. Morro Bay power plant does not now nor has ever had in the past contributed to these priority problems.

In addition, the Regional Water Quality

Control Board has identified rapid sedimentation as the bay's primary problem. In their staff report, the Board's pending regulation and projects to control watershed sediment are directly linked to saving the bay. Based on Morro Bay sedimentation studies, the Regional Water Quality Control Board staff report graphically illustrates the possibility of rapid disappearance of the bay due to sedimentation and the bay volume and habitat. The report also includes the cost benefit of specific projects to restore and preserve the bay.

Both the Regional Water Quality Control Board and the NEP agree that the Morro Bay habitat needs to be restored and preserved for fish and shellfish, providing homes, improving the carrying capacity of the bay, as we were discussing earlier.

How were the plant effects studies designed and analyzed? Both Dr. Raimondi and Mr. Thomas provide us a good description of this technical working group that worked closely together in very good and close scientific cooperation to produce study designs to review the reports to provide critical review of the final reports of both the intake studies and the discharge studies.

We met normally on a periodic basis, sometimes as frequently as monthly, to both look at the incoming data in the form of status reports, make adjustments to our study plans, and reflect both in the study plans and the way we collected data as well as the final analyses. In fact, some of the changes in the study plans and the use and application of models are in the end producing some of the disagreements that we had at this time.

What did we find through these studies? The PWG study spanning nearly two years found negligible intake effects on populations of the ocean-spawning fish using Morro Bay, less than significant potential effects on the populations of Bay-spawning fish, and the absence of discharge effects on beach and sea floor communities. More warm water organisms, algae and invertebrates, were found on the point where the discharge exits and first contacts Morro Rock, as we heard earlier, a distance of about 600 feet from the point of discharge.

Looking more closely at the cooling

water intake effects, the Morro Bay power plant's intake system affects organisms when they accidentally swim into the screens, impinged fish, for example, or drift through the screens with the cooling water flows, for example, entrained fish. The 3/8-inch mesh screens are designed to exclude organisms and debris from the power plant. Organisms too weak to avoid being trapped or entangled in debris are removed by seawater spray and returned with the discharge flow and entrained organisms to Estero Bay at the discharge point north of Morro Rock.

When we looked at our impingement study results, as was summarized briefly by Dr. Raimondi in his remarks, we also agree and concur that they were low in total and in comparison with other power plants, particularly along the coast of California. With lower intake volume and velocity as a result of modernization projects using less intake water, these effects, minor as they are, are expected to be significantly lower than the existing facility's already low impingement rates.

When we looked more closely at entrainment rates and effects, the number of fish that are being entrained in order to determine the effect of the intake were compared to their source water populations, and we sampled those at five different locations. This composite slide gives you a brief overview, a map here on the side with the same sampling stations I believe shown in Dr. Raimondi. Ours are flashing; his weren't.

(Laughter.)

In the left-hand lower corner we have a scale of a dime -- I haven't seen one of those for a while -- and these small fish are actually larval goby that we picked out of the nets that we talked about, and he was perfectly correct to say it was very laborious work, not only collecting them with the large nets you see on the boat here, very large nets, but also picking these out tediously under a microscope and then identifying them. As you can see, they don't look a lot different than what you see right there in the picture, so there are very small characteristics to make identifications correctly.

The explanation of how we computed this proportionate mortality that Dr. Raimondi talked about I think was well-covered, the computational aspects of it. So although I had mentioned this in my summary, I won't go into that right now in the interests of time. And I think we can certainly refer back to his explanation as we go through this if there are other questions. I know Dr. Cowan will have some remarks on that calculation himself.

Entrainment effects were analyzed at the population level and this was as really recommended by EPA and the TWG. We've mentioned already that we selected three population models. The only thing I would add, two of them were eliminated from sort of further considerations, even in our discussion today, primarily because there were issues of estimating the mortality of different life histories of the fish, but, more importantly, those models, in order to do an impact assessment, required that we understood the abundance of the standing stock of adult populations in order to form the same sort of fraction that we're talking about of what's the power plant taking.

When you convert them to adults that the power plant is taking, you need to understand for that fraction how many adults are out there again. So Fish and Game data and otherwise information was not available to do that calculation. So we proceeded by using this ETM model.

The cause and effect of change in ecosystem is complex, and frequently state changes, the introduction of pike into Davis Lake, for instance, can occur with climate or introduced species. For safety margin and reliability purposes, the TWG assessment assumes that the project intake pumps would run at 100 percent of permitted capacity. That was left out of our safety discussion, but in the very beginning the model was set up to assume that the pumps were run full out at their designed capacity. Now we're doing that.

We've re-run the model to reflect the change in permitted capacity under the agreement to cap the new pumps at 370. We also, as Dr. Raimondi mentioned, assumed that 100 percent of the entrained organisms would be killed. We have some information on why we think that that's a very large assumption, particularly in this situation.

Following preliminary analysis, the TWG model was run at an even higher degree of caution, and I'm making reference now that there was a request for us to look at the use of these maximum values which Dr. Raimondi mentioned and come up with an estimate using the same model, if we, in fact, assume that the length of time in the larvae using the model was equivalent to these maximum numbers, rather than the average number.

Use of this maximum number means that all of the base larvae would be at risk for a period of time many times longer than the average age of the larvae actually entrained at the -- or the residence time, as I pointed out earlier in our Bay model, of those larvae at that area of the bay where the intake is taking larvae out of the system.

This assumption is essentially equivalent to assuming everyone in the US would live to be as old as the statistically oldest citizen, increases the estimate of average entrainment from nine to 33 percent. So the crux of the problem was correctly identified in Dr. Raimondi's foundation remarks. We will be discussing that further with Dr. Cowan's analysis of our study.

Using the higher number, and I want to express it this way, really adds a safety margin. In fact, just on a simple proportionate basis, it's a 300-percent safety margin, the difference between using the mean and using this maximum number. There may be very good reasons why the maximum number makes sense to some people. I believe that this extreme use of the conservatism between the two numbers is really inappropriate. And that's why we're trying to be very clear today about how the numbers are calculated and how they're going to be appropriately used to come up with a fair assessment of the intake effects of this new project. It has implications, as we all know, that number, for many other decisions that may be before us today.

Since a full understanding of these safety margins is important to the meaning and context of our results, I will ask Dr. Cowan now to summarize a study and review he did of our model assumptions and work. Thank you.

CHAIRMAN KEESE: Before you leave, one quick question. Just because that map is rather clear here, the discharge canal is on the north side?

DR. MAYER: Right, right there.

CHAIRMAN KEESE: And I heard a reference that the discharge is into Estero Bay.

DR. MAYER: That's this area.

CHAIRMAN KEESE: And that's just commonly accepted that discharge moves south, moves -- I mean, it --

DR. MAYER: Well, this entire area, we've just put the label for Estero Bay there, is referred to --

CHAIRMAN KEESE: The entire area is Estero Bay.

DR. MAYER: Right.

CHAIRMAN KEESE: So the discharge is just assumed to fill the whole thing.

DR. MAYER: The discharge enters through a canal right here at the base of Morro Rock.

CHAIRMAN KEESE: Right.

DR. MAYER: It's a shoreline discharge. It has -- It's buoyant because it's warm.

CHAIRMAN KEESE: But it doesn't stay north of Morro -- There is not an assumption that it stays north of Morro Rock.

DR. MAYER: There is no such assumption to that, but primarily it does. We've learned through our studies of it that there is a gyre, we call it, we a countercurrent that circulates south to north again near the shoreline in the area north of Morro Rock, and that current tends to, when the thermal discharge enters Estero Bay, pick it up and carry it basically along behind the surf line, as well as spreading it out into the open area of the bay.

And as it moves away from the discharge it's buoyant; so, therefore, it lifts, thins, and spreads, and the dissipation of the heat is ultimately to the atmosphere. So it's not only radiation but evaporation that gets rid of the heat from that discharge.

CHAIRMAN KEESE: Thank you.

DR. COWAN: Good morning. My name is Jim Cowan, as was mentioned earlier. And Duke invited me to provide some opinions about a relatively narrow set of the issues here. I primarily was asked to really look at two issues. One was to evaluate the methods of calculation of the proportion of mortality rates in the 316(b) assessment document, and then discuss those effects regardless of the rates and put those in sort of an ecological context. And that's what I'm going to limit my testimony to today.

The other point that I want to make is that we do recognize the uncertainties associated with compensation, and the points that I'm going to make today really don't require any discussion of compensation, although the direct testimony that I provided was mostly devoted to this, because I think it's an important issue. And I certainly would be happy to answer any additional questions about this issue.

I disagree that it's impossible to use what we do know about the fish in Morro Bay to get a forced order estimate of what, how much they should be able to compensate, and so I've tried to provide that in my direct testimony, although I'm not going to cover it much today in my discussion here.

And finally, I want to finish with a brief discussion of the safety margins in the calculations. We've already heard a little bit about this today from both Dr. Raimondi and Dr. Mayer, but I'm going to talk a little bit more specifically about some of the issues.

The first couple of points I think we can dispense with rather quickly. I think Pete was right in mentioning that perhaps the crux of the issue is this agreement to disagree about the entrainment duration or the duration of larvae exposure to entrainment. The first couple of points I want to make are a little bit more simple, and I noticed in the discussion that Pete made earlier, he talked about using weighted means and weighted estimates of abundance.

And what this basically means -- And I would argue that Duke's position is to use weighted averages, and what this means is that you calculate a proportion of mortality for a species and all of those are different, as Dr. Raimondi showed you. Some of those are based on many higher numbers of individuals than others, and what the weighted approach assumes is that there is more confidence in those estimates. I think Pete sort of agreed, you were talking about another issue, about using weighted means.

And so in this case, some of the fish were collected in orders of magnitude of more abundance than others. And the weighted process just takes those means for which most of the information was derived and weights them and estimate the overall mean impact. And that's essentially what was done by Duke. It's essentially the means were weighted by abundance. So abundance means it counts more in the overall average.

It's the most appropriate method as described in several statistical, many statistical textbooks, and this meeting was agreed upon by, at a meeting between Duke and independent scientists which I attended. So I'm a little bit surprised that it's not being considered now, and I'll be certainly happy to address that in direct later on.

The other issue is relative to -- So I think this is what we can dispense with relatively quickly. I think it's the most appropriate way to use, to calculate these numbers, and I think it's also been agreed upon by several of the people here in this room.

The other point I want to make quickly is this notion of open versus closed populations. I'm using the definitions a little bit differently than Dr. Raimondi did. And basically what I'm referring to here is the notion that, as mentioned, the PM calculations are made in two ways. Calculations for the ocean species assume that Morro Bay is connected to the ocean, and I think the animation that Dr. Mayer showed pretty clearly indicated that to be the case. And essentially these populations are assumed to be open.

However, the calculations for the bay species assume that Morro Bay is more like a lake. In other words, it's closed, and its source water volume is much smaller, in relation to the other species of interest. And the PMs for these bay species are higher because of these assumptions. When you calculate a proportion of mortality, the entrainment losses are estimated proportionate to some number in the source water. And if that source water is smaller, it's likely that the PM estimates will go up. I think this assumption plus the larval duration assumption are really driving the center of the bay in this issue.

I would argue that all species are part of larger coastal populations. Bay species spawn in-shore and are delivered to the ocean in large numbers. The data from the 316(b) studies suggest that almost all of the goby larvae as well as many of the bay species were collected in the system almost exclusively on a falling tide, and it's very likely that many of the species, or many of the larvae that were entrained, would end up in Estero Bay. And I would argue that hundreds of millions of these bay species, bay larvae are being exported into Estero Bay, and indeed, unidentified gobies was the most abundant larvae collected at station five in the offshore environment.

In contrast, ocean species spawn offshore, and the larvae use the bay as a nursery area. So there is a different sort of approach as to the way these animals are using the estuary. But I think both of them are part of larval coastal populations, and I can't make a determination which one of these is more important use of an estuary.

So I would argue that if we're making the argument, or I would suggest that if we're making the argument that Morro Bay has value to a coastal ocean ecosystem, you can't assume that it's like a lake when you make the PM calculations. There's a logical disconnect for me there, and I think the reason why some of the bay species estimates are higher is because of this logical disconnect.

So the solution, in my opinion, would be to calculate the PM the same way for all entrained species and use all species to estimate the overall average effects. So it's a pretty straightforward approach.

If you did that, and you assume this is the percent of larvae entrained, this is the weighting factor that we talked about, if you did that, this is the proportionate mortality now adjusted for the percent abundance based on the reduced estimated permanent flow rates, the weighted average comes up to 8.9 for all species. This would be, if you just average these, it would be the weighted average for base bars, so this is the maximum estimated based upon the argument that Dr. Raimondi made.

And there is a difference between whether you consider all species or whether you consider just the bay species, and whether you consider the simple average versus the unweighted average. I would argue that all of these species were entrained by the plant; consequently, they all should be considered in the overall effects.

The third point that I want to make about PM calculations, however, are more related to whether or not it's appropriate to use the mean or the maximum. I think that's really at the heart of the debate, and I'm going to focus a little bit more attention to this next issue.

I think Dr. Raimondi did a very good job of describing susceptibility of entrainment to the power plant, and he showed the size frequency distribution, and while he showed an age frequency distribution, that was obtained based upon the size of the larvae entrained. It can be. In this case, I think it was hypothetical, but it's very similar to the size distribution that was actually observed.

And I would argue that that indeed represents susceptibility to the plant. That essentially describes the age range of larvae that can be entrained. But I think it ignores an important factor in this, and that's the probability that a larvae will actually encounter the power plant. Because what we're really after here is not simply susceptibility to entrainment, it's vulnerability to entrainment. And what vulnerability is, is the product of susceptibility, which is a decreasing function with size, and encounter.

And the bottom line is, is that this is what ultimately determines whether a larva is entrained. It doesn't matter how big the larva is, if it doesn't encounter the power plant it will not be entrained. So that's sort of where I'm going with this.

COMMISSIONER BOYD: Excuse me, Doctor, is encounter a random event in your analysis?

DR. COWAN: It could be. It's certainly an instantaneous event, and I'll sort of talk about that in a second. It happens only when the larvae are close enough to the cooling water intake structure to be drawn in. And there are lots of reasons, which I'm going to list some here, why we don't think that 33 percent of the larvae actually encounter the cooling water intake structure.

MR. ELLISON: Actually, let me stop you.

I want to make sure that your question got answered, Commissioner Boyd. Were you asking whether Dr. Cowan has assumed that encounter is just sort of a random function as opposed to based upon calculated presence in different portions of the estuary?

COMMISSIONER BOYD: Well, I think I heard him say that he had, is going to be showing shortly some rationale for his use of the term, so I will wait for that explanation.

MR. ELLISON: Okay. Well, if you feel like you didn't get one, please --

DR. COWAN: Yeah, please stop me, and I'm glad that you did, and what I would --

COMMISSIONER BOYD: I got an answer and deferred the question too.

DR. COWAN: What I would answer is that it happens instantaneously, and it's definitely not random. And the reason I think it's not random, or several reasons, some of which have been discussed somewhat at length, and one of them has to do with the residence times in the back bay.

The tidal flushing there rates are lower, and larvae there take time to enter into the system and to move towards the plant to which they can be entrained. There are very low flushing times, on the order of 12 to 15 times higher than they are in the lower portion of the bay near the plant. Now you've got me all confused about lower and upper -- near the plant.

The other point is that the water that the plant actually consumes is a relatively small volume, relative to the tidal prism. The actual water -- I mean, the tidal prism is a smaller subset of the actual water in the bay, and the plant itself only takes seven to ten percent of the tidal prism. So, again, that's another reason why we don't think that 33 percent of the larvae encounter the plant when only seven to ten percent of the water is moving through the system.

HEARING OFFICER FAY: And, Dr. Cowan, could you define "tidal prism" for us, besides being a subset of all the water?

DR. COWAN: It's the volume of the water between mean high high and mean low low.

Close enough, Dave?

HEARING OFFICER FAY: So it's roughly the water that gets flushed in and out?

DR. COWAN: It's roughly the water that gets flushed in and out. Keep in mind that some water stays resident in the deeper canals throughout, even at low tide.

The other point I want to make is that ebb tide current velocities by the plant are on the order of two to four feet per second. So you've got larvae that are moving past the plant on an ebb tide, and these animals were almost exclusively present in waters at ebb tides at a present rapid rate, relative to the cooling water intake approach rate, which is on the order of about half a foot per second for the current plant, and is going to be on the order of a third of a foot per second for the modernized plant. So the water that's actually moving towards the plant is moving so at a much lower velocity than the water that's moving by the plant on the ebb tides.

The other point is that there is a small probability if larvae are advected, transported, flushed, excuse me, I apologize if I use -- if I slip into jargon, please remind me and I'll try to define it better. There's actually a small -- As the water is actually moving larvae past the plant into Estero Bay, that water is almost completely replaced by marine water on the next incoming tide. So only about 25 percent of the water that was -- that passed out of Morro Bay is brought back in on the next flooding tide, and that would be 25 percent of the water and it's presumably 25 percent of the larvae.

So the probability of being returned after you advected, flushed into Estero Bay is only about 25 percent. So essentially, most of the larvae that are flushed out of the system stay flushed out and move into Estero Bay.

HEARING OFFICER FAY: Okay, and how do they determine that? Have they done studies with tagging volumes in some way?

DR. MAYER: In just a simple answer, they use salinity as a surrogate, so they watch the mixing of low-salinity water from the back bay with high-salinity water at the ocean entrance.

And so watching the change in proportion of those gave them an index to the proportionate outlet mixing and the incoming. It's a methodology that we've referred to developed by Dr. Largierre at Scripps Institute.

DR. COWAN: And if you assume that larvae behaves similarly, conservatively as passive particles, then the same -- the larvae would have about the same probability of returning as determined by the salt concentration changes.

And finally, we have evidence or at least we suspect that larval behavior, as Dr. Raimondi mentioned, might affect larval retention in the upper reaches of the bay.

I think this is a good slide to illustrate my point, is that here is the cooling water intake structure. Larvae can be retained in the system for many days here, but if they are

retained here and don't make it to here
(indicating), it doesn't matter how large they
are --

HEARING OFFICER FAY: Excuse me,
Dr. Cowan, for my benefit, you're going to have to
imagine that this is a typewritten transcript --

DR. COWAN: Okay.

HEARING OFFICER FAY: -- and you can't
say "here," you've got to say north and south and
mouth of the bay, and that type of thing.

DR. COWAN: Sure. This is a map that
was shown by Dr. Mayer. This shows that the Morro
Bay power plant entrance is located relatively
close to the entrance of Morro Bay. The back bay
reaches are the southern portion of the bay, and
this large expanse of tidal flats. And it was
shown by the animated simulation that, from
Dr. Mayer, is that retention times are quite high.
In the back bay reaches, the southern end of the
bay relative to the area approaching the intake
structure.

So I would argue that regardless of how
large a larvae was, when it got into this region
of the bay, it would be advected, transported
relatively quickly, flushed from the system in

Estero Bay, with only a small probability of returning.

So the residence times in this portion of the bay are really low. And I would argue don't reflect the possibility that larvae would be susceptible or vulnerable to entrainment for the maximum number of days as reported, or as suggested.

And so we're still faced with a problem. How do we estimate the duration of larval vulnerability to entrainment? I've made the argument that it has to take into account both susceptibility and vulnerability, or susceptibility and encounter rate to equal vulnerability. And that's really what we're after.

And I looked at the data and this is essentially, this is just all of the data from all of the larvae that were actually entrained by the plant or collected at station M2, at the mouth of the current water intake structure, at the cooling water intake structure. And I made a simple assumption. I simply assumed that larvae are vulnerable up until the age that they were entrained, but no longer. Because it's hard to make an argument in my mind that if the larvae was entrained when it was five days old that it was vulnerable to entrainment for 20.

So what I did is I took the age, the size distribution of the larvae entrained and I converted that to an age distribution, and I produced a cumulative percentage of the larvae that were entrained at a given age. And what this basically says is that if you look at this figure, at five days about 90 percent of the larvae were less than five days old. This would indicate that about ten percent of the larvae were older than five days old.

And what I did was I plotted on this the 4.25 days old that is the mean age of the entrained larvae, based upon the sampling. And what you'll see is that 77.6 percent of the larvae that were entrained were actually entrained before they were 4.25 days old. And only about one-tenth of one percent of larvae were actually entrained when they were 20 days old. So there is a very low probability that larvae were vulnerable in my opinion to entrainment for 20 days, based on this figure.

The other point that I want to make is

that I would argue that if you're trying to estimate what the true estimate of entrainment, proportionate entrainment is, is that you wouldn't take the age of the oldest individual in the population to estimate what the mean age of the ones that are being entrained in the plant. This would be analogous to taking the age of the oldest living human and estimating how long most people live. And I don't think that's a fair way to sort of approach this.

So what this basically says is that the mean is not only the best estimate, I think, it's also a very conservative estimate of the real vulnerability to entrainment. And I think that -- or at least an estimation for a number to be used to calculate proportionate mortality, and that this represents a relatively extreme safety margin when you're trying to -- when you start making arguments based on the maximum.

The other point I want to make is that susceptibility also declines with size, and I think Dr. Raimondi sort of showed this in his figure, but the point that I want to make here is that this is the age distribution calculated the same way or figured the same way, but this is the age distribution of larval gobies from the stations in the back bay. And what you'll notice here is this is the same 4.25 days. What you'll notice here is that only 63.8 percent now of larvae in the back bay were less than the mean age used by Duke and its consultants in calculating mortality rate.

The point being is that there are many more older larvae in the back bay that are probably destined to recruit in the back bay than there were at the cooling water intake structure.

HEARING OFFICER FAY: Dr. Cowan, I don't know how much longer you have to go. I'm sorry to interrupt you. If there is a good breaking spot, we need to take a break pretty quick.

DR. COWAN: I've got just a couple more slides.

HEARING OFFICER FAY: Okay.

DR. COWAN: Well, maybe we'd better take a break.

HEARING OFFICER FAY: Well, how much longer have you got?

DR. COWAN: About ten minutes.

HEARING OFFICER FAY: Ten minutes, okay.

DR. COWAN: I'll try to hurry.

HEARING OFFICER FAY: Yes, we have to take care of our support crew.

DR. COWAN: I'll try to hurry.

So based on those considerations, I would argue that 8.9 percent, which is the overall weighted mean estimate of entrainment, proportionate mortality, is the best of the PM estimate of proportionate mortality averaged across all species. Forty-three percent is unrealistic because it fails to take into account both susceptibility, which I think Dr. Raimondi did a very good job of describing, but it fails to take into account encounter, and I think that that's a really important issue when trying to decide who and what gets entrained and how long it is at risk to entrainment.

This number, the 4.25 days as a mean is also quite consistent with Dr. Jay's findings that almost all larvae will be exported in ten tidal cycles; in other words, if you start from anywhere in the bay, based on the action of the tides, in about five days, assuming that the larvae act as passive particles, they will be transported from the system. So again, it's another indication that the 4.25 mean age as an estimate of duration of exposure is probably a pretty good one.

And the 8.9 percent is also consistent with the ratio of cooling water intake volume to the tidal prism. Understand that goby larvae, which sort of the argument is kind of focused on because they were such a high percentage of the larvae entrained, were the most ubiquitously distributed larvae in the system. I find it difficult to believe that a much higher percentage of goby larvae would be entrained than water that is actually entrained by the plant relative to the cooling water intake flow. So I think that's sort of a reality check in my opinion, that you've got the most uniformly distributed animal in the system, and the proportionate loss is essentially equivalent to the proportionate loss of water through entrainment.

The last couple of things I want to mention are related to population effects and this is sort of now shifting from the calculations. A lot of the mortality rates are naturally very high. Dr. Raimondi indicated that, and for most species like estuarian species we're talking about survival being near zero, one or two percent or less. The implication is that most larvae die soon after hatching.

But there has been some suggestion in some of the staff reports that this means that entrainment mortality is made important. And I don't think that that's true, and I'll tell you why. One of the things I think we need to take into consideration and it reflects back on your example is that fish are unique among vertebrates. Each female can produce thousands to millions to perhaps billions of potential offspring in the case of some of the rockfishes. But also keep in mind that in order for a population to remain stable, only two need to survive to be able to contribute to the reproductive population in future years. So the expectation is that most of these animals die soon after hatching.

Fish that live in estuaries are adapted to variable conditions. They counter this by producing huge numbers of eggs and larvae, and again, the expectation is that most will not survive.

But one or two percent survival represents a lot of survivors. In this case, it may be millions of larvae. Bay populations I suspect are limited by adult habitat and not by the number of larvae, and I think this is a very important point relative to the comment that you made.

What this means is that adult population size and stability, in my opinion, are more a question of habitat than larval production in this system. That's not to say -- That's not to counter the potential for them to contribute to populations elsewhere as they're advected from Morro Bay. And certainly, with respect to gene flow and some other issues besides population dynamics, the fishes that are advected into the coastal ocean may be quite important.

COMMISSIONER BOYD: Excuse me, could I go back, not on slides, but just you said larval mortality is pretty well accepted at near zero, one or two percent or less. Is that in this estuary, is that commonly accepted for fairly natural settings and not added stresses from unusual human activity and what have you, or is this an average of all of that?

DR. COWAN: Mortality is a very difficult parameter to estimate what the true rate of mortality is. It's generally, and one or two percent survival is generally the survival to be expected through the entire larval stage. And that's sort of an average of all species or all marine species. It can be higher for some species that invest more in their young prior to the larval stage. It can be much lower for animals that don't invest anything in their young. It's a tradeoff between the numbers of eggs produced and how much maternal investment each female gives in her eggs.

And the bottom line is, is that it's an average across many species, but there are many exceptions and I'll be happy to address specific questions about those later on if you want.

I don't know if that answered your question?

COMMISSIONER BOYD: Yes, thank you, it does.

DR. COWAN: It's just hard to generalize, because fishes do so many things.

COMMISSIONER BOYD: I guess I wanted to make the point it is hard to generalize.

DR. COWAN: Yes, it is. It's very hard to generalize.

So I think that, coupled with the information I just provided, the fact that entrained larvae in this particular case are small and young does indeed cause the effects of entrainment to be reduced. This has been shown in other power plant studies and in numerous applications of fisheries models to larval losses.

The fact that impingement mortality is low and that the entrained species are not equal to the impinged species is also somewhat unusual and I think is a very beneficial thing in this case. And the entrained species, at least the ones that are entrained in high numbers, are not otherwise harvested. And I think that both of these things affect, essentially act to minimize cumulative effects, which is very important and somewhat unusual relative to other cases that I've looked at.

The last couple of things, I have two slides. This is the notion about entrainment survival. This is the point that Dr. Raimondi talked about. This is not something that's being used in Duke's calculations, Duke's and its consultants' calculations for entrainment survival in any way, but it's conservative. It's not included in the PM estimates, and these are all of the data that exist for entrainment mortality studies.

Currently the approach is to assume 100 percent entrainment mortality through the plant. I would argue this is probably not true. This is survival on this axis, so survival going this way. And this is a whole bunch of different taxa for which entrainment survival studies have been done. This is striped bass, white perch, this is clupeids, herrings, anchovies, several other taxa. And I've put the data here for the taxa that were most closely related to the Morro Bay species in this thing, on this figure, and what you'll notice is that gobies, blennies, and silversides, which are closely related to the jack smelt, have reasonably high survival through the plant.

And many of these studies have, there are weaknesses in these studies. Many of them don't follow larvae, or, in fact, very few of them follow larvae after they've been released into the wild, but it is misleading to say there is no information. And I also think that it's important to note that many of these studies -- By the way, this is sort of two standard errors and this is the mean rate.

And what you'll notice is that the mean

survival is approaching 50 percent. It's only lower than 50 percent, which is 25, 50, 75, and 100, survival is only lower for the clupeids and the anchovies, which are notorious sensitive to handling. And it's quite a bit higher for many taxa and approaches 75 to even 85 percent for species like gobies.

So the potential is quite high for survival through the plant, and many of these outcomes are based on larvae that were held for 72 hours after having been passed through the plant, although they were held in a laboratory setting. So it's not just once they're removed from the pipe if they're alive or not, it's that they've been held for some time and observed prior to being moved through the plant.

And the other point is that some mortality is due to cropping, and this is actually based on the result from these studies, it suggested that a fair amount of this, the mortality that actually occurs, is due to cropping; in other words, things get eaten as they pass through the plant. And so they're not necessarily lost to the food web, and I think that's a point that someone had made earlier. And it's certainly something that is spoken about in the results of these studies.

This is a compilation of all the data that exists for these kinds of studies up until 2002.

The other safety margin I think is that the current estimates of PM assume no compensation, and I think that that was a point that was brought forth in Dr. Raimondi's overview, but I think that there is much empirical evidence that it exists, although I agree that the magnitude is difficult to estimate. And I will certainly talk more about this if needed, because much of my direct testimony was devoted to this issue.

The magnitude is difficult to estimate, but it's not impossible, and I think it's possible to use life history information to at least develop a first order approximation of whether a species is likely or not to be able to compensate for mortality. I think an important thing about compensation here is that it does, it is sort of an ecological premise that results in stable population. The idea being here that populations can increase beyond need for replacement, and that's an important issue. And this whole notion of compensation underlies fisheries management.

And I do want to challenge a statement that was made in the overview. I think that it's unfair to blame failure in fisheries management exclusively on the models that use compensation in them, when fisheries' governance is probably implicated more. People manage fish. And the failure of fisheries management I think is more attributable to fisheries governance than it is to the assessment models that are being used to offer information to the managers.

HEARING OFFICER FAY: Okay. Why don't we take a break here. Dr. Mayer was going to sum up, but I think that this is a good breaking point.

(Brief recess.)

HEARING OFFICER FAY: We're back on the record and we'll allow Duke to conclude their direct testimony.

Mr. Ellison, it's your time.

DR. MAYER: Just a comment or two, having listened to the exchange of ideas between Dr. Cowan and Dr. Raimondi's points of view, I just want to make it clear to the Commissioners and others that we're not asking for any new consideration of assumptions.

The assumptions that we're talking about are already built in, the safety margins are already built in to the model calculations that are being discussed today. We've built in the assumption that the plant operates 100 percent flow. We've built in the idea to these model results that 100 percent of the larvae going through the power plant are killed. They don't come back out the other side. They're not lost to the ecosystem, products of that event still go out into Estero Bay.

But we're not asking for new assumptions. We're simply asking, even in the case of considering the difference between using the mean age and the maximum age, a clear consideration that that represents a significant conservatism, a significant safety margin to the kinds of results we're considering here.

Taking neither side of the case at this point, we're not asking that there be new assumptions built in, we're considering the degree and extent, the meaning of those that are already, in fact, calculated in our results.

As mentioned in my opening summary, the modernized intake discharge flow and those that are below any reasonable base line eliminate the significant CEQA impacts. Sustained reduction in cooling water flow will minimize existing adverse effects in combination with EPA-recommended habitat restoration and represent BTA for the modernized facility. I recognize that the habitat restoration is a piece still to be discussed.

The CEC staff's recommended closed-cycle cooling alternative with costs approaching $200 million is clearly, in my mind, wholly disproportionate to the possible benefits, especially when the Regional Water Quality Control Board's estimated costs to implement sediment controls that would save the bay are approximately a tenth of the closed-cycle cooling system costs.

The Morro Bay power plant, in keeping with EPA's encouragement to develop new intake technology, I believe is a good candidate to test the aquatic filter barrier technology -- We've heard reference to that and it's in our direct testimony. We would do this at a pilot scale. We recognize there are a number of site issues specific to that technology that would have to be examined for the Morro Bay setting. But it does offer the possibility of reducing if not eliminating entrainment and impingement, most importantly, without the high cost in visual impacts of closed-cycle cooling.

Using air-cooled cooling technology to prevent entrainment of larvae at the power plant's lower bay location would have no discernible effect on Morro Bay spawning populations. Based on the rapid tidal flushing in the intake area that we looked at in that earlier graphic representation of the model run, there is little if any likelihood that a larva not entrained through any kind of an intake technology at that location in Morro Bay would recruit or join, if you will, the adult population in the parental habitat, which for most of the bay species we've been discussing today, is in the bay proper and certainly more towards the upper bay, back bay.

However, restoration protection of upper bay habitat for larvae and adults would benefit the bay and those populations. Now, we've heard there's discussion about we don't know that the bay habitat is, in fact, limiting what the carrying capacities are. It's clear that there has been a long and extended loss of bay habitat, and we believe that that is something that let's change, restore, and at that point let nature take its course, but there is an issue of limited habitat when you consider both bays and estuaries along our coast. So the addition would hardly seem to be moving in the wrong direction.

The modernized project represents positive change for the bay through a more efficient use of less cooling water. I think that's an important issue. And a unique opportunity to restore and save the bay habitat, which we will discuss in more detail at a later date.

Thank you. Any questions?

HEARING OFFICER FAY: Thank you. I think -- If the Committee is willing, we'll hold our questions until the end and allow the parties to cross-examine.

DR. MAYER: All right. Thank you for your attention.

HEARING OFFICER FAY: Are the witnesses available, Mr. Ellison?

MR. ELLISON: They will be, after I make one explanatory comment.

HEARING OFFICER FAY: Okay.

MR. ELLISON: I do want it to be clear what is in dispute and what is not, because some of the testimony which you've heard addresses issues that are not actually in dispute, but which we have testified to in order to provide background to those issues that are in dispute. Let me be clear what I mean by that.

Here are the issues that are in dispute. There are three. They are the issue of do you use a weighted average, or do you use a simple average? Secondly, there is the issue of do you count all of the entrained species, including the ocean species, or do you only account for averaging the bay species. This is the issue of are you going to treat the bay as an open system or are you going to treat it as a closed system.

And the third issue that's in dispute is this issue of do you use the 20 days, or do you use the 4.25 days? And this is this issue that Dr. Cowan testified to about susceptibility and vulnerability -- I mean, I'm sorry, susceptibility and encounter versus susceptibility.

Those are the three issues that are in dispute. The issues of 100 percent mortality assumption, the issue of compensation, and the other issues that were discussed were only discussed in order for the Committee to understand that although Duke and the technical working group all agree on that, that those, in Duke's view, are safety margins that are already built in, and that you should have that in mind when we look at the issues that are in dispute, that from Duke's point of view -- and others may agree or disagree, but from Duke's point of view, that these are safety margins that are already built in in order to account for uncertainties in data and those sorts of things, and that are already represented in Duke's averaging numbers.

So, with that explanation, I just want the record to be clear about why we're saying what we're saying and for what purpose, the witnesses are available for examination.

HEARING OFFICER FAY: Okay.

MR. CHIA: Mr. Fay?

HEARING OFFICER FAY: Yes?

MR. CHIA: This is Dan Chia, Coastal Commission. I just wanted to let you all know that Deborah Johnson has joined us now.

HEARING OFFICER FAY: Okay. And

Ms. Johnson, give us an idea of how long your remarks are.

MS. JOHNSON: I won't be making any remarks today, I just wanted to be able to listen in to the testimony.

HEARING OFFICER FAY: Oh, all right, fine. So we were planning on just continuing with the cross-examination of the applicant, if that is consistent with your understanding.

MS. JOHNSON: Yes, it is, thank you.

HEARING OFFICER FAY: All right.

Ms. Holmes?

MS. HOLMES: Thank you. I don't believe we did introductions this morning, so for those members on the panel who haven't met me before, my name is Caryn Holmes and I'm the attorney for the Energy Commission staff. Good morning.

I'd like to start with Mr. Ellison's most recent comments, and I don't know which are the correct witnesses to direct those to, so I will just let Dr. Mayer decide.

CROSS-EXAMINATION

BY MS. HOLMES:

Q Mr. Ellison just said that there were three issues in dispute: the use of a weighted versus a simple average, inclusion of all entrained species or estuarian species only, and the question of whether to use the average or the maximum time at risk. Do you recollect what he said about that, that those were the three main issues?

A Yes.

Q And isn't it true that Duke's position on each of those three issues is to take the position that results in the lowest rates of proportionate mortality on each of those three issues?

A No, I don't agree that's the reason they're taking the position.

Q I didn't ask you whether or not that that was the reason, I was asking you whether that was the result. I could break it down, one by one.

A Yes, please.

Q Duke is recommending that the weighted average be used rather than the simple average; is that correct?

A Yes, we are.

Q And does that result in lower proportionate mortality numbers than if you used a simple average?

A It does under the conditions that we're looking at.

Q And, similarly, with the question of inclusion of whether or not all entrained species are only estuarian species should be included in the mortalities, is it true that Duke's position results in the lower estimate of the two choices?

A By coming the ocean and the bay species estimates of PM into this average, total average, that would produce a lower total average.

Q And finally, the same thing with the issue of the time at risk, Duke's position is that the average time at risk is appropriate versus the maximum, and that would also result in a lower estimate of proportionate mortality?

A The time of risk for the species that we're considering is lower on average than it is for the maximum value for those same species.

Q Thank you. I have just a real quick question about something that I read on page seven of your rebuttal testimony. There have been some discussions about the recalculations that were done, actually I believe it starts on page six of your rebuttal testimony. It talks about Duke

recalculating entrainment losses for unidentified gobies. Do you recollect that testimony?
A Yes, I do.
Q I just would like to know whether or not you recalculated loss for any of the other species, specifically blennies or jack smelt?
A I want to look at that portion of the rebuttal.
Q Sure.
A Could you give me the page reference, again?
Q I believe it's on page seven of rebuttal testimony to the Regional Board staff report for the regular meeting of May 30th.
A There may be some page numbering here, but I think we have the statement. If you could read it, and then we would just check.
Q It's really a very simple question. There is a reference in there to a recalculation which may, in fact, be included in your direct testimony as well, recalculation that you did of --
A This is in conjunction with the TWG?
Q Yes, and I'm just curious, actually, as to whether or not you did a similar recalculation

for blennies and jack smelt.

A No, we didn't. The answer, in sort of a prolonged way --

Q That's all right.

A -- the answer was that we worked, could only really work with a species that had an appropriate sample size, and the unidentified goby category is really the only species in our sample that constituted eight percent of the samples taken that gave us enough sample size to produce a length frequency analysis.

Q Okay, thank you. Could you turn to page 66 of your direct testimony, and there is a statement in the second paragraph that begins with the words, "The persistence of these fishes."

A Yes.

Q Did you provide evidence in your testimony of what the persistence of the species was over 40 years?

A We have no historical record of the persistence over that period of time. Our evidence is based on the fact that they were recorded in a previous survey occasion, and we have the same set of species here in the set as we conducted most recently for the entrainment studies.

Q But you don't have any evidence from 40 years ago about what species existed in the estuary in what distribution or what proportion?

A No, we don't.

Q Thank you. There is a reference on page 48, although I'm not sure you need to turn there, to seasonality of spawning events. I think it's fairly well accepted that there are such spawning events that occur seasonally; is that correct?

A The species have different peaks and valleys of their spawning table.

Q I want to try to explore a little bit with you about the cap that Duke has proposed on water use and what the relationship is to that. It's my understanding that what Duke has proposed is, in essence, an annual average daily cap. In other words, I believe the number is -- I'll have to get this one -- I believe it's 370; is that correct?

A 370.

Q Thank you. But that doesn't mean that the plant is only going to use 370 million gallons a day, does it?

A On average.

Q But not on a given day.
A On any given day, an average wouldn't necessarily apply.
Q Right. So, in other words, the plant, in fact, could operate for fairly long periods of time in excess of 370 million gallons per day, correct?
A Well, that would then have to be offset by an equal number of days low enough to have produced an average of 370.
Q Correct, I understand. And I'm just trying to get the point across that it's not a daily limitation at all, it's simply a limitation -- I'm sorry, did you have --
A No, go ahead.
Q -- it's simply a limitation, it's simply an annual average number; is that correct?
A That's correct.
Q So if there, in fact, was, let's say, a specific spawning event that one was concerned about, the fact that there was a cap of 370 million gallons per day on an annual average, does that tell you anything about what the effect of the project is on that specific spawning event?
A Let me understand your question.

Q That's fine.
A You've presumed that we know what the spawning events are?
A I'm assuming that you know that.
Q I'm not sure that I can make that assumption, but I will, for this --
A Thank you.
Q So if we assume that we know just when the species would be spawning, and then the next assumption is that there would be some sort of peak pumping, you're asking?
A What I'm asking is, perhaps I should ask it in a different way. Let's assume that you do know what that spawning event is, the fact that the project over a year had an annual water use of 370 million gallons per day, it doesn't tell you anything about the plant's impact on that specific spawning event, does it?
A No, an average wouldn't tell me about any day, what the pumping rate would be on that day.
Q For example --
A Without the spawning event.
Q Right. The plant could have been operating, could have been using no water during

that spawning event, or, in fact, during that entire spawning event it could have been using the maximum rate of 475 million gallons per day, and still met its annual average.

A That's correct.

Q Thanks.

MS. HOLMES: I want to just preface my next statement by saying that I appreciate Mr. Ellison's comments about what is at issue and what isn't. I think that with respect to the entrainment survival rates, we don't agree that that's a safety margin, so I'm going to ask at least a couple of questions about that.

BY MS. HOLMES:

Q Earlier this morning, Dr. Cowan, you talked about and I believe you presented a slide that shows some survival rates for various species that have been entrained; do you recollect that?

A Yes, I do.

Q And do you know how many of those estimates, particularly for the species that you said were in Morro Bay, how many of those estimates were made in the field or in a laboratory?

A Most of them were actually not made in either. They were based upon samples that were retained on site at the power plant in a holding facility. They weren't transported to the lab, nor were they done in the field. So they were held on site, adjacent to the power plant in question.

Q So they weren't studies of what happened to the larvae after they were, in fact, discharged out to the ocean.

A No, and I think I actually mentioned that in my testimony. They were, however, done, in many cases, for up to 72 hours post-delivery into the holding facility in which they were held.

Q Do you know whether or not the discharge and the intake structures in those facilities that were studied were identical to those in Morro Bay?

A Not identical, no, I don't know that, but they were a wide variety of data in that report. Essentially it was a summary of all the data that exists in this particular issue.

Q So you would expect, in fact, that the discharge and intake structures, in fact, in some cases might have been quite different.

A I'm sure they were.

Q Thank you. Just a quick question on

page -- Your slides are numbered twice. It's actually slide 28 on population effects, where you reference -- there is a bulleted item that says, "Entrained species not otherwise harvested."

A Yes, I have it.

Q When you say that the entrained species were not otherwise harvested, do you mean harvested by human activity, by people directly?

A Yes, I'm talking about fishing mortality, essentially.

Q So you're not talking -- Would you agree that, in fact, there are harvesting-like effects that can occur as a result of anthropogenic forces such as sedimentation, pollution, things like that for those same species?

A I think that -- I don't agree completely, because harvesting generally affects a specific life stage, and it's generally the adult stage. And changes in carrying capacity and changes in habitat and sedimentation don't necessarily affect the adult stage specifically. And I think when you refer to harvesting, it's generally on adults, which has been shown to have significant consequences because of these stages that were being harvested.

Q Maybe I misunderstood what you were saying. Were you implying that the adult of these species are not affected by sedimentation or pollution effects?

A I'm saying that I'm not sure how these effects affect carrying capacity in the environment. We are reasonably certain of the consequences of harvesting adults.

Q If I can go back to the entrainment survival issue, just one last question, these studies that you referred to, who were they funded by?

A They were compiled by the Electric Power Research Institute.

Q Thank you. And, let's see, lastly, I think if you could turn to your slide 23, Conclusions and Reality Checks, there's a discussion in there and you discussed earlier this morning about the consistency of the ratio, the proportion of your tally that you came up with, with the ratio of intake volume to tidal prism; do you recollect that discussion?

A I do recollect that. I do want to point out that I didn't come up with any of these numbers, I was simply asked to review the method in which they were calculated.

Q Do you think that it would be appropriate to use that kind of volumetric approach to represent the loss for all the entrained species, the blennies, the clams, the jack smelt?

A I think that it's appropriate for species such as gobies, which are ubiquitously distributed in the bay, I think that there are some issues related to other species that may not apply.

Q So, in other words, you think that the volumetrical approach is appropriate if there are some species that are ubiquitous, but it would not be appropriate for determining impact to other species.

A I did not say that. I think --

Q Well, then correct me, please.

A -- I think that -- I'm thinking of one particular case that it may not apply, and that is for the comb-tooth blennies. And I suggested that maybe because blenny habitat is essentially most abundant near the plant, and associated with the rock jetties and the pilings and the piers, and the plant may actually sample the blenny population differently than they exist in the bay proper.

For the other species, I think it probably does represent a pretty good way to get at the likelihood that they would be entrained.

MS. HOLMES: I'd like to ask questions of whichever of you gentlemen was involved in the technical working group process from the beginning. I don't know if that's you, Dr. Mayer.

BY MS. HOLMES:

Q Wasn't it an assumption of the technical working group in designing the 316(b) studies that volumetric approaches to estimated mortality were not appropriate?

A I'm not sure I'd characterize it assumption. I think we considered actually a volumetric approach in our beginning discussions of how to model entrainment effects.

Q And wasn't that rejected in favor of coming up with an estimate of larval loss that was independent?

A I think that -- Yes, I think the approach that we took, and I'm not sure it's yes in answer to your question, but the approach we took was a synthesis of some of the points that

Dr. Cowan just made, that if you have a water body that has a uniformly distributed population of species so that there are no geographic differences in it, then it would be a very fair way, probably a very efficient way to make these kinds of estimates.

Where we believe there might be population differences in the water body, as Mr. Cowan said, with reference to the blennies or other species like that, then we felt that there was a possibility like that. So that's why we chose not to do it that way, by just a volumetric basis.

Q Thank you.

DR. COWAN: I would also like to add that if you're interpreting this to mean that that's the way the estimates of entrainment mortality were calculated, you're in error. I was just making it as a comparison, in terms of a reality check. It's an expectation of mine that an animal that was as ubiquitously distributed as goby larvae and many of the other ones should be essentially entrained at about the rate water is moved through the plant.

That's an assumption of mine, but it in

no way entered into the calculations that I showed you in a table earlier in my talk.

BY MS. HOLMES:

Q And that was a part of my question that was an assumption of the technical working group; was it not? That you weren't going to use a volumetric approach for the 316(b) study?

A We used the approach that it was as reported in 316(b) resource assessment.

MS. HOLMES: Thank you. I think those are all my questions.

HEARING OFFICER FAY: Another gold star for Ms. Holmes.

MS. HOLMES: I have quite a collection of them now.

HEARING OFFICER FAY: In view that we choose to enjoy lunch at this time, we thank Ms. Holmes for making it possible to not wait another hour. So I think we will take a half-hour for lunch, and I understand that there is lasagna available, and please, let's resume right at 12:30.

(Thereupon, the luncheon recess was held off the record.)

--oOo--

AFTERNOON SESSION

12:35 p.m.

HEARING OFFICER FAY: We will now move to CAPE's cross-examination of Duke's witnesses.

MR. NAFICY: Shall I wait for Mr. Ellison to come back?

HEARING OFFICER FAY: I think so. Off the record.

(Off the record.)

HEARING OFFICER FAY: Back on the record.

MR. NAFICY: I'm sorry, some of these questions will have to go over briefly some areas that have already been discussed and raised by Ms. Holmes, but I want to start off by talking about this voluntary cap that Duke has recommended, the 370 million gallons daily.

CROSS-EXAMINATION

BY MR. NAFICY:

Q Is Duke inclined to request any kind of a daily or weekly caps?

DR. MAYER: I haven't heard of any such thing.

MR. NAFICY: I'm sorry, seasonal caps?

MR. ELLISON: Well, just for the record,

there is -- Duke has proposed two caps, a daily cap and an annual average daily. The 475 is the daily cap, which corresponds to the maximum capacity of the pumps. And there is a 370 annual daily average proposed.

MR. NAFICY: Right, I don't want to belabor that point, but it's unfair to suggest that the 475 is a proposed limit. That's the actual limit imposed by the equipment.

MR. ELLISON: As I said, that's equal to the capacity of the plant. If you want -- keep going, I don't want to take your time.

MR. NAFICY: Okay.

MR. ELLISON: I'm sorry.

MR. NAFICY: Thank you.

Now, there was a question earlier about particularly the high density of certain larvae that have a chance of being entrained in certain times of the year. So I wanted to explore that a little from whichever of your experts.

Is it true that certain times of year, the studies have shown that in certain times of the year there's a greater abundance of larvae in the estuary than other times?

MR. ELLISON: You're speaking of larvae

generally? Not any specific species, right?

MR. NAFICY: Well, not yet. I'm speaking generally at the moment.

DR. MAYER: As I said earlier, there are highs and lows in the larval concentrations, which for the year study that we did we could certainly see in the results.

MR. NAFICY: And could you describe the highs and lows, if you recall, which seasons you noticed higher larvae concentrations than others?

DR. MAYER: Again, which larvae are we talking about?

MR. NAFICY: Okay, at this time, let's talk about gobies, which were the predominant species that were entrained. For gobies, do you know which season would be the highest concentration?

DR. MAYER: Gobies, as far as we know, spawn year round, multiple spawners. So we would expect to see their larvae in the water column essentially throughout the year.

MR. NAFICY: Agreed. I'm just wondering if there are significantly higher, or higher during certain times of the year as compared to other times.

DR. MAYER: We had peaks that went both up and down throughout the year. I think some of the peaks occurred more in the spring, but there were also some peaks that occurred later in the year.

MR. NAFICY: Okay, could I refer you, please, to table 4 of your testimony, which comes after page 48. I'm sorry, actually, could you just go to table 7, which comes out after 53.

DR. MAYER: Table 7 are you referring to?

MR. NAFICY: Figure 7, I apologize, figure 7. Are you there?

DR. MAYER: I can see that figure.

MR. NAFICY: Okay. Now, is it true then that the highest concentration of these unidentified larvae was recorded looks like June 1, is that correct?

DR. MAYER: That's very close, reading the scale as best I can.

MR. NAFICY: And isn't it true that the second highest concentration was found in the following sample date?

DR. MAYER: Again, looks very close.

MR. NAFICY: Right. And then you don't

have this probably in front of you, but the 316B study, page 4-53, there are a couple of surveys dealing with black-tailed bay shrimp.

You don't have that in front of you, but would you be surprised to know that the highest concentrations found there were also around June?

MR. ELLISON: If you're going to ask him a question about that, I'm going to ask --

DR. MAYER: I'm going to look it up.

MR. ELLISON: -- that you look at it.

DR. MAYER: And your reference, again, please? On what page?

MR. NAFICY: It's 4-53.

DR. MAYER: Talking about impingement surveys?

MR. NAFICY: Yeah, that is an impingement survey.

DR. MAYER: We were talking about entrainment. Now we're talking about impingement?

MR. NAFICY: Well, these were the highest concentrations if impinged -- right, but I guess my point is that there are great seasonal variations, and that at certain times it appears, according to the data, there's vastly greater concentrations of what are caught, either through impingement or entrainment.

DR. MAYER: I agree that there are seasonal variation in what we're looking at. And looking to your previous example where you asked me to look at the second highest peak in June, there are also similar high peaks, or peaks similar to that, throughout the year.

If you'll look at the same figure back in February, you'll see on that's very similar to that.

MR. NAFICY: Yeah, I see.

DR. MAYER: Okay.

MR. NAFICY: So, do you know in what season the proposed plant is likely to be operated the greatest percentage of the time?

DR. MAYER: No, I don't.

MR. NAFICY: Is there anyone on the panel who can testify to that?

DR. MAYER: I don't think there's anybody here with that kind of expertise.

MR. NAFICY: Okay. Would you be willing to accept seasonal or daily or weekly caps to account for spikes in larvae abundance?

MR. ELLISON: That's really not a question related to the testimony. If you want

Duke's position I would be happy to tell you what it is.

MR. NAFICY: I guess that's what it amounts to, what is Duke's position on that?

MR. ELLISON: Duke's position is that the reduction in the capacity of the pumps, 475 from 668, operates as a daily cap that is well below what the current plant can do.

So, if you care about what is happening on any given day, the modernized plant is reducing cooling water withdrawals from 668 million gallons a day to 475.

If you care about what's happening over time, then the annual average cap of 370 is relevant.

Based on that, Duke does not see a need for a daily cap beyond the 475, or any seasonal cap.

MR. NAFICY: I appreciate that, and I really want to be very respectful, but that was an argumentative answer to a question that was a pretty straightforward yes or no.

I want to move on. There was some discussion about how long the larvae stay in the estuary from beginning, when they're first hatched, I would imagine, until they flush out.

And I think according to Dr. Jay's calculations and reliance on that, is it Duke's position that, I believe it was stated earlier, that the larvae are flushed out in five days? Is that -- am I correct?

DR. MAYER: I'll answer, and then ask Dr. Jay to clarify, if you have a question then.

That's referring to the entire Bay, so it's an average from the top to the bottom, upper to lower Bay.

MR. NAFICY: I'm sorry, what does that mean? That larvae from the back Bay will take five days for it to be transported to the front of the Bay? Is that what it means?

DR. JAY: Those calculations assume that larvae or water parcels are equally, you know, distributed -- they are equally distributed throughout the entire volume of the Bay. They do not take into account the fact that the residence time in back Bay is 15 days, and residence time near the plant is one day.

MR. NAFICY: I'm sorry, I couldn't quite hear you. Could you speak a little bit closer?

DR. JAY: That calculation is based on

assuming that larvae are equally distributed throughout the entire volume of the Bay; they therefore do not take into account the fact that, as David has shown you, that residence time is low near the plant. That is to say things are flushed out very rapidly. And high in back Bay, so that they're flushed out maybe after 15 days, on average.

MR. NAFICY: So have there been actually studies to calculate residence time in different parts of the Bay?

DR. MAYER: He showed you one such study, and I believe that that is in TetraTech's modeling study published in 1999. That is a study of the residence times.

MR. NAFICY: I'm sorry, when you say he showed me, do you know if it referred to a slide, or what?

DR. MAYER: That was in the direct presentation that showed you the animated flushing of the Bay. That's from the model that's --

MR. NAFICY: Oh, I see.

DR. MAYER: Yes. There's also a figure in that same report that showed you -- that I used in my presentation that showed the flushing rate, half-life.

MR. NAFICY: I see, but that wasn't a study of fish, that was a study of salinity. Am I right?

DR. MAYER: It says -- yes, what I showed you was based on the study of salinity of the Bay. In that report, on that model, TetraTech also suggests that model's appropriate for larval fish.

So I asked you, I think, in my direct, to make the assumption that salinity could be thought of as equivalent to the movement of passive particles such as larval fish.

MR. NAFICY: Do you accept that it's appropriate to -- is it appropriate to assume that a salinity study is just directly applicable to draw conclusions about larval stay time in the Bay?

DR. MAYER: I think I just said I don't assume that. That there is obviously a need to somehow extrapolate from one to the other. There isn't any clear connection that I suggested in my testimony of a way to do that.

I'm using that to illustrate the flushing of the Bay.

DR. JAY: Could I add one thing to that, David?

DR. MAYER: Sure.

DR. JAY: In Dr. Cowan's direct testimony, I believe, these referred to as reality checks. While it is true that you cannot necessarily in every case make a one-to-one correspondence between salinity and larvae, nonetheless, you can use information about the salinity distribution to provide important reality checks on larval loss calculations, which are dependent on many assumptions.

MR. NAFICY: What is a reality check?

DR. JAY: Essentially whether you're getting a realistic answer or not.

MR. NAFICY: Okay. Now, how does the result of the salinity modeling compare with the estimates, I mean I want to refer to slide number 22, which looked at the age distribution for gobie larvae in the back Bay.

It appears that, if I'm reading this right, in this back Bay where the study, where the data was taken, something like 37, 36 percent of the fish were older than five days. And then there's a sharp increase.

Doesn't this suggest that -- I mean I understand you said it's complex and we don't understand it very well, --

MR. ELLISON: Objection.

MR. NAFICY: To?

MR. ELLISON: To the characterization of his testimony.

MR. NAFICY: Okay.

MR. ELLISON: The transcript will stand for what he testified to.

MR. NAFICY: I understand.

So doesn't it suggest that there are other factors besides salinity that account for resident time? As the flushing of the Bay?

DR. COWAN: Yes, and I think that I actually indicated that in my testimony. And I think that the analogy here is that the younger and smaller the larvae are, the more likely it is that they behave like passive particles.

But in my direct testimony about why I suggest larvae certain -- why all 33 percent of the larvae don't encounter the plant, I indicated that larval behavior is an important factor. It perhaps very well be the larger larvae get the more likely they are to be able to effect their own distribution in the system to some degree.

And so the notion that susceptibility, which is the slide was meant to address, decreases with size and age, may reflect a whole suite of things. But one of which may be larval behavior.

MR. NAFICY: Now, on this issue, as long as we're talking about larvae behavior, a number of times you stated that assuming larvae are passive particles. Did you, in your analysis, assume that larvae are passive particles?

DR. MAYER: The illustration I used in my direct testimony this morning with reference to the flushing of the Bay and the salinity model, is that -- we're still discussing --

MR. NAFICY: Yes.

DR. MAYER: And I made it very clear that I didn't represent that as any more than a salinity flushing model, but it does show, the model does show the movement and exchange of ocean and Bay water.

MR. NAFICY: Okay, now what about you, Dr. Cowan, did you, in your analysis of vulnerability and susceptibility and, you know, the exposure to the intake, did you assume the larvae to be passive particles?

DR. COWAN: I didn't do any direct analysis. I was just making inference based on my understanding of larval behavior, as well as the flushing times for passive particles in the system.

As I mentioned before, I think there are many mechanisms that may act to retain older larvae in the upper Bay, and one of those is the effects of flushing time. We're not simply talking about older larvae; small larvae are produced in the back Bay, as well.

And I suspect that they behave a lot more like passive particles than do older larvae.

MR. NAFICY: Are you aware of any studies that show that larvae, in fact, have been recorded not to act like passive particles, you know, many different sizes and environments?

DR. MAYER: There are a number of larval studies, particularly fish, and I'll even say with respect closely to San Francisco Bay, you know, Sacramento, San Joaquin Delta studies.

The answer to the question, though, if you're trying to find a reason to regard them as inert particles really depends on their size, as Dr. Cowan was saying.

So as the larvae, which were sort of the average of what we were entraining, which are very very small larvae, 3 to 4 or 5 millimeters, are essentially, at that size, inert particles, unable to move themselves up or down or sideways, or against a current, to any great extent.

That doesn't mean that they can't, on a daily basis, make some small migration, or even take advantage of currents. But, in general, the larger the larvae becomes the more likely they are, in fact, to make choices about their location with respect to depth, or the position in the estuary, et cetera.

DR. COWAN: I would also add, in response to your question, that there are many many studies that suggest that they behave exactly like passive particles when they're small.

MR. NAFICY: Okay. I wanted to talk a little bit about the notion of this abundance of larvae and how, I think you said something like one, approaching 1 or 2 percent of them survive to be recruited as adults, and there's this over-abundance of larvae.

Why do fish produce the surplus egg and larvae? This is a thing Dr. Cowan was who I had in mind.

DR. COWAN: I think part of the reason was touched upon by Dr. Raimondi in his presentation this morning. Fishes live in variable environment. And they -- it's essentially what is referred to as a bet-hedging strategy.

The idea is that you produce many many larvae, particularly in estuary situations, over generally a very long, protracted spawning season, with the notion that in some years, in some locations, some will survive to reproductive age.

The point is that it's a tradeoff between maternal investment by producing millions of eggs, essentially release them free in the water column to whatever fate may hold them. And that there's no maternal investment. And it allows you to produce year after year after year very high numbers of eggs and larvae --

MR. NAFICY: I'm sorry. Is there some relationship between the conditions where the fish are spawning and the variability and the number of different stressors, like, you know, geographically, heat, predators. Does that relate to the number of eggs that are hatched?

DR. COWAN: I wish that it did, because as a person who has spent his entire career studying the relationship between the numbers of eggs and larvae produced and how that ultimately affects the numbers of survivors, it would be quite easy if I could tell you yes.

But the bottomline is that there' absolutely no relationship between the numbers of eggs and larvae that are produced and the ultimate number of fishes that survive to contribute to the adult population later on for a variety of reasons.

And I wish I could tell you otherwise. It would make my life a lot easier, quite frankly.

MR. NAFICY: But there is a set of factors that influence harmony of the eggs actually surviving and maturing into adults, and those factors may vary from year to year, is that correct?

DR. COWAN: There are a set of factors, correct. Do we know what those factors are, no.

MR. NAFICY: You know some of them, right? I mean, if there is an el ni¤o, does that affect rate of recruitment?

DR. COWAN: For some species, yes.

MR. NAFICY: Right, so there are other seasonal variations, in an estuary, for example, in the amount of fresh water that comes in, or either natural phenomena that -- I think you, yourself, testified earlier that the high abundance of fish eggs is supposed to allow long-term survival because they're not susceptible to these changes, isn't that correct?

DR. COWAN: Partially correct. I think that you're over-simplifying the case, because the issue is that there's a lot of environmental variability on every scale that we examine it.

And to be able to distinguish a relationship between the numbers of eggs and larvae produced and the number of adults has not been possible in almost any case.

MR. NAFICY: I understand. Now, do these variables, as complex as they are, and as little as we know about them, do they operate on the Morro Bay Estuary?

DR. COWAN: Yes.

MR. NAFICY: Okay.

DR. MAYER: Could I clarify just one moment, though. I'm not sure we're acknowledging that there's little known about them.

MR. NAFICY: Okay, well, if you know about them, let's talk about these factors that affect success of recruitment in the estuary.

DR. MAYER: You listed a number of factors as to what -- relating them to these recruitment, I don't know that we have evidence relating those to recruitment. I mean we've studied it, and we can't find the connections.

MR. NAFICY: Okay.

DR. MAYER: I think that's what Dr. Cowan said.

MR. NAFICY: But these natural factors that affect success of recruitment in, you know, percentage of fish that actually survive, these natural phenomena still operate on the Morro Bay Estuary today, is that correct?

DR. MAYER: I think you're still asking -- there is a theoretical set of some conditions, I think we can all agree to, that in one way or another affect populations.

We don't know whether or not those are -- what they are or how they're operating in Morro Bay, and that's --

MR. NAFICY: That's fine. I'm not asking for an analysis of the mechanism. And this is really pretty simple, I just wanted to establish that we are -- you know, assume operating under the same conditions that could result in fluctuation and the success of the various species that lay eggs in this estuary.

Now, the entrainment mortality that is caused by the once-through cooling, and I don't want to get into the percentages, or what percentage of it is, but that is on top of the natural phenomena that also cause fluctuation in this recruitment success rate, isn't that true?

DR. MAYER: I think at this time all we know is that we've estimated the entrainment mortality. We're not able, or even put forth any argument that it's on top of an addition or a subtraction from any other factor.

The dominant factor, I think, that we've talked about earlier is the natural mortality of larvae from all the things that come in and go out of their environment.

MR. NAFICY: Right, and those are assumed in effect in the Morro Bay Estuary today, those natural factors that you just alluded to?

DR. MAYER: There still is natural effects.

MR. NAFICY: So did you suggest just a minute ago that perhaps the mortality would be -- or the entrainment mortality would be a net benefit in terms of success rates for these species? Were you suggesting that?

DR. MAYER: I didn't suggest that I don't believe.

MR. NAFICY: Okay. I think at some point in your testimony you suggested that -- I was just coming back in the room, so I apologize, so please correct me if I'm wrong, but did you suggest that NEP has not -- does not consider, you know, entrainment impact to be significant -- I'm sorry, again. Can you just restate what you said?

DR. MAYER: I had direct testimony with a slide that I listed the seven priorities or problems for Morro Bay that had been identified by the NEP's coalition process with scientists and other parties to their trying to identify those kinds of problems at Morro Bay.

And I made the point that on that list, found in there, Morro Bay's -- I'll get the name of it right -- conservation management plan, comprehensive conservation management plan, that that list did not include the Morro Bay Power

Plant.

MR. NAFICY: Are you aware of a set of research priorities that that same document identified?

DR. MAYER: You would have to direct me to that. Are you making reference to -- you tell me.

MR. NAFICY: Yeah, I am actually making reference to that CCMP that you just referred to. You say it doesn't list effects of the Morro Bay Power Plant as one of its seven impacts.

Why don't you take a look at page 5-20.

DR. MAYER: It will take just a moment to get it out.

MR. NAFICY: Okay.

(Pause.)

MR. ELLISON: Mr. Naficy, it would be quicker if you have a copy that you want to provide to the witness. It'll take a minute for him to find this.

MR. NAFICY: I'm sorry, I understand and I do apologize. I didn't know I was going to bring this up until I heard him mention --

MR. ELLISON: I'm just trying to save time, that's all.

MR. NAFICY: I understand.

(Pause.)

MS. HOLMES: Can I just ask a brief question of clarification. Is that included on Duke's list of exhibits?

MR. ELLISON: We docketed the executive summary.

MS. HOLMES: Is it listed as an exhibit?

MR. OKUROWSKI: The executive summary is listed as an exhibit. It's called, Turning the Tide, and it would be located 249.

MS. HOLMES: Thank you.

MR. ELLISON: Just for the record let me say that CAPE has provided to the witness a single, two-sided page. At the top it says chapter 5. At the bottom it has page 5-20, and 5-19. And it lists a series of -- okay, I've just been provided with another two-sided page.

So what we have are pages 5-17 through 5-20 of -- we don't have the title page, but I assume, subject to check, that this is from the NEP conservation plan that Mr. Naficy referred to, pages 5-17 through 5-20 now.

MR. NAFICY: I'm sorry, have you had enough time to look at that document?

DR. MAYER: Could you redirect where you would like me to look, please?

MR. NAFICY: Well, I don't have it in front of me.

DR. MAYER: Just tell me where you'd like to direct --

(Laughter.)

DR. MAYER: -- direct.

MR. NAFICY: There's a portion, I think, in that first page that you were given, I --

DR. MAYER: What's the page number, again?

MR. NAFICY: I think it's 5-19.

DR. MAYER: All right, I have that.

MR. NAFICY: There's a reference to research -- this is the area subject called research priorities, and then there's a section where it discusses research priorities or research projects that need to be done regarding the effect of the Morro Bay Power Plant.

Are you there yet?

DR. MAYER: This is the heading point source?

MR. NAFICY: Yes.

DR. MAYER: That's on 5-20?

MR. NAFICY: I'm sorry, you have my copy, so --

(Laughter.)

MR. ELLISON: Maybe this will help. Page 5-18 of the document has a subtitle, research priorities for Morro Bay.

Page 5-18 lists research priorities for Morro Bay. And beginning on 5-19 are a series of sub sub-headings, sediment reduction with four items; public health issues with three items; reduction of freshwater flow with six items; water and sediment quality with ten, if I counted them correctly, items; habitat health with 13 items; tracking species diversity with two; point sources with four; and I believe that what you're directing him to is one of the four items under point sources, is that right?

MR. NAFICY: Well, there's actually more than one, but, yeah.

MR. ELLISON: But that's where you want him to look, correct?

MR. NAFICY: That is.

MR. ELLISON: Okay. You need this back?

MR. NAFICY: Well, not at the moment.

MR. ELLISON: Okay.

MR. NAFICY: I don't want to take any more time than we have to on this subject. I just wanted you to look at that, and could you just read into the record the research priorities identified by the NEP with respect to the Duke Power Plant?

DR. MAYER: There are three that say what are the effects of the Morro Bay Power Plant on Bay circulation, entrained larvae, and air deposition.

MR. NAFICY: So in light of the fact that those areas have been identified as, you know, areas for future research, is it possible that once the research is done, that the effect of the power plant would be considered then by the NEP to be a significant impact on the estuary?

DR. MAYER: The nature of the research is to find out, you know, what might be possible. I wouldn't disagree at this point without the research that it isn't possible, but I don't think it's likely if, in their considerations, they hadn't identified some problem that they felt was related to the power plant.

MR. NAFICY: Thank you. I want to talk about this voluntary 370 million gallons. Can somebody explain to me how this figure was arrived at?

MR. ELLISON: I'm sorry, I was returning the exhibit to Ms. Groot. Where are you?

MR. NAFICY: I'm not anywhere. I'm just asking the 370 million gallons, how was that arrived at?

MR. ELLISON: I apologize, I thought you were referring to the page.

MR. NAFICY: That's a question.

DR. MAYER: That's not something I know about.

MR. NAFICY: So none of your marine experts know how the 370 million gallons was arrived at?

DR. MAYER: I can't speak for all of them, but I don't believe they do.

MR. NAFICY: Well, can anyone else answer the question?

MR. ELLISON: I can give you a statement from counsel, if you wish.

MR. NAFICY: Well, I would like to -- okay. Why don't you tell me, was this 370 million gallon figure based on a carrying capacity study of the Morro Bay Estuary?

MR. ELLISON: No.

MR. NAFICY: Was it based on any biological studies of the estuary whatsoever?

MR. ELLISON: Would you like me to explain how it was arrived at?

MR. NAFICY: No, actually I prefer this.

(Laughter.)

MR. NAFICY: Was it arrived at by looking at average water use in the past ten years?

MR. ELLISON: In part, yes.

MR. NAFICY: And what else was it based on?

MR. ELLISON: The figure was arrived at based upon -- Duke had presented testimony during the soil and water portions of this hearing that for various reasons it thought that it was legally impossible for the facility to run on a long-term basis at the figures proposed by staff in the FSA.

And that it was very unlikely that it would run at those figures, as well.

Subsequent to that testimony, Duke decided the cleanest way to remove this issue was to propose a legally binding permit limit. The level that was chosen was originally 400 mgd. It was then lowered to 375 mgd; and ultimately to 370 mgd.

Those levels were chosen in order to bring the level below all of the arguments that CAPE and staff have made about all of the different possible baselines that have been put forward as appropriate historic water use baselines for CEQA analysis.

MR. NAFICY: Has Duke conducted a study of the effect of that historical water use you just referred to? Not just a snapshot in, you know, any given day, but the historical, long-term water --

MR. ELLISON: I really don't think it's appropriate for me to -- if that question's directed to me, I think I can answer how the 370 was chosen. I've just done that, as Duke's attorney. But if you want to continue to cross-examine the witnesses about their direct testimony, --

MR. NAFICY: I'm sorry, I was just looking at you, but I really meant --

(Laughter.)

MR. NAFICY: -- for your whole panel. Anyone can jump in and answer that question.

MR. ELLISON: Let me just say this. These witnesses have testified in some places to the -- have used the 370 figure in their testimony. Now, they have not testified as to how it was arrived at, I have just explained that.

If you want to ask them about what's in their testimony and what the effect of the 370 is on their analysis, that's certainly within the scope of their direct.

MR. NAFICY: I'm sorry, I've gone beyond how you arrived at 370. I understand that now. My question is have there been any studies of the long-term effect of the power plant's use of once-through cooling on the estuary.

MR. ELLISON: Okay.

MR. NAFICY: That's the question.

MR. ELLISON: All right, well, let me turn that over to the panel.

DR. MAYER: Yes.

MR. NAFICY: And can you describe the study, please?

DR. MAYER: There were several studies. And several of them were, in fact, related to the power plant, itself. And others were background studies of the natural resources in Morro Bay.

MR. NAFICY: But were the studies designed specifically to assess the effect of the once-through cooling, or were they just characterizing the Bay?

DR. MAYER: They were specifically designed to study the once-through cooling effects.

MR. NAFICY: Okay. Can you identify those studies, because I'm not really familiar with them?

DR. MAYER: There were studies conducted by Pacific Gas and Electric when they were the owners of the facility, to study the rate of impingement at the intake system.

And then there were comprehensive studies of the discharge, which included thermal modeling and studies of the organisms in the receiving water.

MR. NAFICY: What about the effects of entrainment?

DR. MAYER: There were no effects of entrainment studies during that period of time.

MR. NAFICY: Okay. Now, I believe you started your testimony today by -- or you certainly testified in your written comments that because there are still populations of fish in the Bay, that shows that somehow the effect of entrainment can't be significant. Is that a good characterization of your statement?

MR. ELLISON: No.

MR. NAFICY: Well, can he answer the -- I mean he made the --

MR. ELLISON: I object to the question as mischaracterizing his testimony. If you want to ask him what he testified to, he'd be happy to repeat it.

MR. NAFICY: Okay, well, that's the area I'm interested in. Could you just restate your testimony for the purposes of this discussion?

DR. MAYER: In my direct testimony today I made a statement as to if the plant had -- the effects of entrainment had been on an order of 33 percent reduction in the Bay's productivity that there would have been a very clear and apparent loss of the Bay's resources over the period of time the plant's operated.

MR. NAFICY: Okay, clear and -- what do you mean? What would you have expected to happen if it was really 33 percent mortality? What kind of effects would you expect?

DR. MAYER: Well, I used the word productivity not mortality.

MR. NAFICY: Okay.

DR. MAYER: That's a 33 percent reduction in productivity rate.

MR. NAFICY: Okay, taking productivity, what kind of effect would you have expected?

DR. MAYER: Well, that's a continuing decline in the ability or the rate of the estuary to produce all sorts of things, marine resources.

MR. NAFICY: But I mean are you aware of the productivity or the rate of organisms that -- the abundance of organisms or the diversity of organisms that existed in the Bay before the plant got started?

DR. MAYER: No.

MR. NAFICY: Okay, were there population level studies of, for example, gobies in the past, to identify a base level for the population of gobies to be able to compare that with what we have today to see if there is a decline or a stability?

DR. MAYER: The studies that were done in Morro Bay were more of a survey nature to try to develop the species composition of the Bay's fisheries.

They weren't directed at trying to estimate gobie populations.

MR. NAFICY: So, really, there's no way to know if the plant, the once-through cooling has caused a decline in population of the species we know are highly entrained?

DR. MAYER: There is no historical record that we could compare to in order to make a determination of a change. That doesn't mean that we couldn't, as we have done, estimate what that might look like, based on population analysis.

MR. NAFICY: Do you have an estimate of the population number of gobies in the estuary today?

DR. MAYER: No, I don't.

MR. NAFICY: I'm not sure who used this. Wasn't there an assumption made at some point in one part of the testimony of something in the order of one adult gobie per square meter? Was that assumption made as part of your direct testimony?

DR. MAYER: That's correct.

MR. NAFICY: And what was that based on, that assumption?

DR. MAYER: I'm going to check the source.

MR. SPEAKER: It was just a guess.

DR. MAYER: It was just a guess.

(Laughter.)

MR. SPEAKER: And it was a -- well, I didn't mean to interrupt, but Mr. Steinbeck here did some, call it -- guess, as to if this was the case, then we would look at that in order for a comparison --

MR. STEINBECK: It was based on some numbers from a study of gobies down in the San Diego and Mission Bay, and trying to extrapolate some of those numbers and be really conservative. And so I just used an estimate of one per square meter, thinking that it probably would be a lot higher than that, but that that was a conservative estimate for the density.

MR. NAFICY: And the conditions in San Diego Bay are comparable to the estuary here?

MR. STEINBECK: I didn't look into that at all.

MR. NAFICY: Okay. Now, have you studied -- not you, but has Duke studied the indirect effects of the entrainment mortality on the species that prey on not just larvae, but of fish that are higher, you know, more adult, or fish that feed on the larvae?

DR. MAYER: Have we studied those species?

MR. NAFICY: Well, have you studied the effect of entrainment on those species?

DR. MAYER: What species are we talking about, that will be affected?

MR. NAFICY: Well, species other than the ones that are directly entrained.

DR. MAYER: No. We're talking about the effect of entrainment on those species.

MR. NAFICY: Correct. I'm talking about indirect effect of entrainment. And obviously the direct effect on the dead larvae is that they're dead. But, you know, assuming that there's an indirect impact, I was wondering if Duke had really looked at the indirect impact of the entrainment in your --

DR. MAYER: Well, I don't assume there is such, but we haven't studied that.

MR. NAFICY: Right. I understand you don't assume it. Do you think there is an indirect impact from the losses caused by entrainment?

DR. MAYER: No, I really don't think there's a direct or indirect impact.

MR. NAFICY: Are you familiar with any studies regarding the diversity of the taxa that exist in Morro Bay today, as compared to studies done in the last 10 or 20 years?

DR. MAYER: Of what species are we talking about?

MR. NAFICY: Generally taxa of fish and other marine organisms.

DR. MAYER: Well, we have, as I mentioned earlier, studies from PG&E's impingement studies that we were able to compare to ours. We have studies from Department of Fish and Game.

MR. NAFICY: What about the NEP study that TetraTech did that came out last year? Have you looked at that?

DR. MAYER: There is a study. I'm not sure how that would allow me to compare the past.

MR. NAFICY: Well, the study actually does the comparison with past studies. So you're not familiar with that study, I --

DR. MAYER: I am familiar with that study, yes.

MR. NAFICY: Oh, you are familiar with the study. Do you know if the study found that there was a greater number of taxa today that they were able to find of say crustaceans as compared to studies that were done in the '70s?

DR. MAYER: I think there's some serious questions about that study in terms of the taxa identifications, and which are very important if you're going to make comparisons to the number of species of the ability to identify and correctly count the number of different species.

MR. NAFICY: I'm sorry, have these questions that you allude to been recorded somewhere, been officially registered with --

DR. MAYER: This is my opinion.

MR. NAFICY: That's your opinion.

MR. STEINBECK: There was also a number of criticisms of that study in regards to the level of sampling effort that went into those estimates.

MR. NAFICY: So you're basically saying that the results of the study are invalid, is that correct?

DR. MAYER: I'm saying I'm not sure they're reliable to use to the question that you're asking about, species diversity, and comparing it.

MR. NAFICY: Are you aware of what the results they found were? Whether they are reliable or not?

MR. ELLISON: Are you referring to any specific results? Could you be clear about that?

MR. NAFICY: Well, yeah, I mean I asked about crustaceans, I can ask about mollusks or fish or whatever. I mean they did a bunch of studies; and made a bunch of comparisons.

And, you know, I'm looking at mollusks and this is what's referenced in my direct testimony. This was -- or whatever you want to call what I submitted. But in the rebuttal they had a chart made specifically referring to what I'm talking about now.

There's a reduction in the number of taxa. And I was hoping we could talk about that and whether you can rule out entrainment as a contributor, as a stressor to that.

MR. ELLISON: Would you like to refer the witness to your testimony and to that chart? He's already testified he's familiar with the study.

MR. NAFICY: Right, but I mean -- yeah, I would like to talk about these findings, and whether we can, you know, he's looked at them and compared them to the results of the entrainment study.

MR. ELLISON: Well, why don't you restate your question.

MR. NAFICY: This study, this 1999 TetraTech study refers to a number of reasons why they found fewer taxa, what they consider significantly fewer taxa. And then one of the reasons they cite as possible is -- are the stressors on the Bay.

And it seems pretty clear to me that entrainment is a stressor. So, I wanted you to comment on that and explain if you can rule out entrainment and impingement effects of -- well, entrainment of once-through cooling as a contributor to this, what they found to be reduction in taxa.

MR. ELLISON: And that's really not a very good question. Why don't you refer him to the specific statement and give him -- we have the study right here, so just give him the statement, where it is, and if you want him to comment on it, he'll comment on it.

MR. NAFICY: I'll do that if you promise not to comment on my questions. It's on page 6-5.

MR. ELLISON: I will not promise not to object to your questions.

MR. NAFICY: No, but I mean whether they're good or bad. It's 6-5, it's the first full paragraph.

HEARING OFFICER FAY: Is this in your direct testimony?

MR. NAFICY: It's in the rebuttal.

DR. MAYER: And where are you looking on the page?

MR. NAFICY: That first full paragraph listing findings regarding taxa.

DR. MAYER: I'm looking at page 6-6 --

MR. NAFICY: I'm sorry, 6-5.

DR. MAYER: Sorry. I'm matching that to your table. I'm looking at your rebuttal testimony and trying to match that to the --

MR. NAFICY: I'm not sure that's a useful exercise. Just look, if you have the page in front of you, -- 31 taxa of crustaceans were collected in the 1998 surveys, which is fewer than the 52 taxa known for Morro Bay. And there's a cite.

Similarly, 18 taxa of mollusks were collected in 1998, which is substantially less than 86 species of snails, et cetera, that says were previously reported.

And at the end of that paragraph they say, differences in species richness may be related to sampling efforts, seasonal differences, sampling locations, types of substrate survey and/or stressors.

And it seems to me that clearly the continued operation of the plant is a stressor. So, according to this study, recorded phenomena in the Bay.

DR. MAYER: Well, I will -- I'm not sure I have an answer to your question, either, except to say that the study had a fairly limited sampling plan, or design. I'm not sure that it's, we're to try to draw these kinds of conclusions from that sampling.

Well, if it's stressors or not, I think in the list that you, or the place you're referring to, it did list, of course, sampling effort, as you said, as one of the primary sources of difference between these studies.

MR. NAFICY: No. They listed in seriatim and didn't identify one as primary or anything. They just said -- but, anyway, the record stands on its own.

I just want to move on, and for the sake of getting this thing over quicker, I want to talk about this notion, Dr. Cowan, your discussion of vulnerability and susceptibility.

I want to refer to direct testimony at page 63, please. That last paragraph, second sentence, it says -- well, you're going to have to read that whole thing.

(Pause.)

DR. COWAN: Are were talking about the last paragraph on page 63?

MR. NAFICY: Right.

(Pause.)

DR. COWAN: I have it.

MR. NAFICY: Okay. Now you make a statement here that we need to assume, and I quote, "that all larvae are vulnerable to entrainment up to the age at which they were entrained, but no longer."

Now, if you're a larvae and you didn't get entrained at 4.25 -- I don't understand this statement that you're only vulnerable until the age that you are actually entrained.

Aren't you vulnerable to entrainment if you're a larvae in the Bay? Doesn't that make you automatically vulnerable?

DR. COWAN: No.

MR. NAFICY: Now, in your analysis, there's a graphic that was part of the first presentation where there was a mean age at 4.25 days. And that's, I think, what you're suggesting should be the cutoff for considering the vulnerability phase, is that correct?

DR. COWAN: I'm not describing it as a cutoff. I suggest that it produces the best available, or the most defensible estimate of what entrainment mortality rates or proportional mortality rates are, given the uncertainties in encounter rate.

MR. NAFICY: So how many of the sample, that particular sample, were actually entrained before the age of 4.25?

DR. COWAN: Almost 78 percent.

MR. NAFICY: Okay, now the 22 percent that on that sample were entrained after the age of 4.25, they were still entrained?

DR. COWAN: Yes, but keep in mind it wasn't a sample. That was the age frequency distribution of all the entrained larvae.

MR. NAFICY: For what period of time?

DR. COWAN: For the entire study. It wasn't a single day or a month, that was the accumulated -- it was, I forget how many individual were actually, but it was thousands of larvae that were used to create that age frequency distribution. And the cumulative distribution function. That was based on the age frequency distribution of the entire sample of larvae at the cooling water intake structure.

MR. NAFICY: I'm not exactly familiar with the sampling that was done, but you mean to tell me that every single entrainment sample that was taken for the study, the larvae were characterized as to their age?

DR. COWAN: They were measured as to their length, and that was converted into an age based upon a growth rate.

MR. NAFICY: Okay, but the 22 percent that were entrained beyond the age of 4.25, they were still entrained, correct?

DR. COWAN: Yes, but I think that it's

important to examine the figure. Because what you'll see is that at that point, the breakoff point between 77 and 22, the function is rising very steeply, and by seven days almost 100 percent of the larvae had been entrained.

MR. NAFICY: But isn't it also true that as the larvae grow and age, in number of days, fewer and fewer of them are actually available in the system? Don't they die off, also, because of other reasons, at a rapid rate?

DR. COWAN: That's true, but I think it's important to remember that there were more older larvae available in other reaches of other places in the Bay than were sampled at the plant. Based on the same sorts of data collected at stations M3 and M4. There was a higher fraction of older larvae in the upper Bay.

MR. NAFICY: I want to get back to this, the 22 percent that were older than 4.25 were, in fact, entrained, therefore I think it just follows that they're more vulnerable to entrainment.

DR. COWAN: I'm basing --

MR. NAFICY: -- in fact, entrained.

DR. COWAN: There's no doubt in my mind that they are susceptible to entrainment. I think that it's also reasonable to assume that some larvae, over the entire age distribution of larvae that were susceptible to entrainment, will encounter the plant.

The question is whether or not enough encounter the plant to result in a 33 percent proportional mortality. And that's the issue, in my opinion.

Some larvae that are older than 4.25 days do encounter the plant and get entrained. The question remains is that is it likely to be 33 percent of those larvae.

MR. NAFICY: Now, there was also testimony, I think, as to those 25 percent of the larvae that are flushed out will come back to the Bay in the next coming tide, is that correct?

DR. JAY: The concept we have used is called the tidal exchange ratio; and the tidal exchange ratio is the amount of new water entering the Bay on each tide. Under the assumption that larvae are evenly distributed throughout the Bay, then since 75 percent of new water comes in on each tide, it follows that that water, if we assume there are no larvae outside, the larvae are in the Bay, that 75 percent of the larvae in the tidal prism went out, not to return.

MR. NAFICY: Right, but then that is if you made the assumption then that only 25 percent of the larvae did leave the Bay, actually come back, is that correct?

DR. JAY: Twenty-five percent, yes, that's correct.

MR. NAFICY: Right, but that wasn't actually based on a study of the larvae concentration in the incoming tide, was it?

DR. JAY: That was based on the salinity distribution, Dr. --

MR. NAFICY: Correct.

DR. JAY: -- definition of tidal exchange ratio.

MR. NAFICY: But if larvae don't act as passive particles, it's at least possible that a greater concentration of them will actually move towards coming back, they would put themselves in the position of coming back to the Bay, isn't that correct?

DR. JAY: That's a hypothetical. It's possible.

MR. NAFICY: Right, but you just testified that your analysis of 25 percent is not based on any behavior analysis or any actual studies. It's based on an assumption that they just come back with the incoming tide, which assumes passive particles, which we had testimony by your experts that they're not.

MR. ELLISON: I'm going to register an objection here in two ways. One, you're characterizing the witness' testimony incorrectly. Secondly, you're arguing with the witness.

He did not testify that he had not based this on any studies, specifically.

HEARING OFFICER FAY: I'm going to sustain the objection, and ask if you could please, you know, shorten it and simplify the questions so that they are succinct. I think it will be easier for the witnesses to respond, and certainly be easier for me to follow.

MR. NAFICY: Okay, let's go back to this concept of 25 percent of the tide coming back. There was an assumption that that means, an assumption on your part, I believe, that 25 percent of the larvae contained in the outgoing tide is coming back with the incoming tide, is that correct?

DR. JAY: We assumed that, we analyzed

the salinity data and determined that 25 percent of the water would come back, yes, that's correct.

MR. NAFICY: Correct, but I wanted the next step. Did you draw any conclusions about what percentage of the larvae that left the Bay on the outgoing tide would then come back?

DR. JAY: I conducted studies that calculated the consequences to hypothetical larvae that are equally distributed, evenly distributed throughout the Bay.

MR. NAFICY: Apart from your assumption that they're equally distributed in the Bay, did you also assume, for those calculations, that they act as passive particles?

DR. COWAN: Yes.

MR. NAFICY: Okay. Dr. Cowan, did you testify that in some instances, especially with larval gobie, they, in fact, don't act like passive particles?

DR. COWAN: Yes.

MR. NAFICY: Okay, now, assuming that Dr. Cowan just stated that larvae, at least in some instances, don't act like passive particles, is it possible to refine your assumption about 25 percent larvae coming back? Is it possible that in fact, greater than 25 percent are coming back because they may want to come back in some way?

DR. COWAN: I think if you look at the data they're actually in the 316 resource assessment, you'll find that a significantly smaller fraction than 25 percent come back.

The gobie larvae, in particular, as many of the other Bay species, were collected almost exclusively on ebbing tide, and the concentrations of larvae on the following flood tide were much much lower and considerably less than 25 percent.

MR. NAFICY: Just a moment, please.

(Pause.)

MR. NAFICY: I wanted to briefly talk about the notion of cumulative impacts. There was testimony earlier today that the cumulative impacts of entrainment are low because the impingement impacts on different species. Could someone -- was that your statement, Dr. Cowan?

DR. COWAN: Yes.

MR. NAFICY: Okay, did I characterize your statement correctly?

DR. COWAN: No.

MR. NAFICY: Okay, could you set the record straight, please.

DR. COWAN: What I suggested was is that the cumulative impacts were lessened by the fact -- I didn't say low, I said reduced by the fact that the species that were entrained were not the same ones that were impinged necessarily. And that the species that were entrained were not otherwise harvested. And I was referring essentially to harvested by fishing efforts.

And what I said is that they were reduced, but not low.

MR. NAFICY: Okay. Do you think that the cumulative impacts -- can you characterize the cumulative impacts of entrainment as low, high, medium?

MR. ELLISON: I'm going to have to ask you to clarify the question, because cumulative impacts are, by definition, an accumulation of more than one thing.

MR. NAFICY: I understand.

MR. ELLISON: So, cumulative impacts of entrainment is asking for the cumulative impacts of one thing.

MR. NAFICY: Well, cumulative -- I understand.

MR. ELLISON: Entrainment plus what?

MR. NAFICY: I understand. Well, that's actually going to be my next question. The effects of entrainment we understand, and you know, have a difference of opinion about what exactly, how much they are.

But we understand that once-through cooling causes larval mortality. Based on your understanding of the Bay, are there other causes of larvae mortality in the Bay?

DR. MAYER: None, other than the natural mortality of the larvae suffered by larvae fish.

MR. NAFICY: Do you include anthropogenic causes such as pesticide runoff and other forms of pollution?

DR. MAYER: I'm not sure if I include making any statement about them. I have no information on them.

MR. ELLISON: Let me ask for a clarification. Mr. Naficy, are you referring to cumulative impacts in the CEQA sense, meaning cumulative impacts between this project and other projects, as defined by CEQA?

MR. NAFICY: Well, I --

MR. ELLISON: Are you -- let me finish -- or are you using the word cumulative in the lay sense, meaning just an accumulation between any two things.

MR. NAFICY: The latter, except not with any two things. I wanted to explore if there were other stressors on the Bay that cause a similar impact.

And so, I'm sorry, going back. Are you stating then that you're not aware of the levels of say pollution in the estuary?

DR. MAYER: I'm saying I don't know the relationship between that and larvae mortality, I think was your question.

MR. NAFICY: Right. Well, I was trying to be clear if you knew about the levels of pollution. Do you know if there is a pollution problem in the estuary?

DR. MAYER: I'm still trying to answer your question, I think, which was directed at making some sort of a connection between larvae mortality and other effects.

MR. NAFICY: That was my previous question. My question is are you aware of a pollution problem in the estuary.

DR. MAYER: There are a number of things that are being treated as pollutants coming into the estuary through different programs.

MR. NAFICY: Such as what?

DR. MAYER: Sedimentation.

MR. NAFICY: What about pesticide runoff?

DR. MAYER: There's a large number of -- a lot of work going into non point source control, a number of these things.

MR. NAFICY: What about heavy metals?

DR. MAYER: That heavy metals are a part of their control programs, Regional Water Quality Control Board programs.

MR. NAFICY: And has nitrification been identified as a problem in the Bay?

DR. MAYER: I believe the Regional Board also lists that as a potential problem today.

MR. NAFICY: And these problems, all these issues I just listed, pesticide, heavy metals, nitrification, do they have an impact on larvae mortality, do you believe?

DR. MAYER: I'm not aware of either concentrations or the level of concentration necessary to affect any mortality on the larvae in the Bay.

MR. NAFICY: So in your review of the

various studies of the Bay, the analysis done by the Regional Board, and studies done in connection with this project, you have not formed an opinion as to whether these various sources of pollution in the Bay cause any additional mortality to the larvae in the Bay, is that correct?

DR. MAYER: We've not studied or reported on that. Yes.

MR. NAFICY: I understand you haven't reported on it, I was asking you for your opinion. Is it correct that you've studied the Bay extensively?

You know what, I'm sorry --

DR. MAYER: Yeah, I'm sure, yes, we've studied the larval fish in Morro Bay for a period of nearly a year recently, which involved a great deal of study.

MR. NAFICY: Any of your other experts can answer the question regarding the connection between these different sources of pollution and larval health and mortality in the Bay?

DR. MAYER: I don't see anybody raising their hand.

MR. NAFICY: Can I assume that the answer is no?

MR. ELLISON: I think you can assume that the answer would not be any different than what Mr. Mayer gave, yes.

MR. NAFICY: This is the last area. There were a couple of references to the proposed EPA regulations for 316B regulations for existing plants. I'm not sure who commented on those.

DR. MAYER: Was it -- could you restate some --

MR. NAFICY: There were some comments in the direct presentation about the proposed 316B regulations for existing plants.

DR. MAYER: Yes, that was in my direct.

MR. NAFICY: Right. Is it true that these regulations are proposed and they're not final?

DR. MAYER: That's correct.

MR. NAFICY: And is it also true that regulations can undergo a great deal of change from their proposed form to the finally adopted form?

DR. MAYER: It's possible.

MR. NAFICY: Nothing further.

HEARING OFFICER FAY: Is that it for the Duke panel? Mr. Naficy?

MR. NAFICY: Yes, I don't have any further questions.

HEARING OFFICER FAY: Okay. Does the City of Morro Bay have any questions?

MR. SCHULTZ: No, the City has no questions.

HEARING OFFICER FAY: Okay. Thank you. Ms. Holmes -- oh, I'm sorry, Mr. Ellison. I don't mean to rob you of your redirect.

MR. ELLISON: I agree with the gold stars, but --

HEARING OFFICER FAY: Yes. I was trying to earn you one here.

(Laughter.)

MR. NAFICY: I assume I don't get any.

(Laughter.)

MR. ELLISON: Okay, we do have some redirect.

REDIRECT EXAMINATION

BY MR. ELLISON:

Q Dr. Mayer, Ms. Holmes asked you a question about Duke's position on the three issues that I identified as being in dispute, and whether Duke's position on each of them would reduce proportional mortality, do you recall that question?

DR. MAYER: Yes.

MR. ELLISON: And you testified that with respect to each of the three issues that Duke's position would have the effect of reducing proportional mortality, correct?

DR. MAYER: Correct.

MR. ELLISON: I would like to ask you about three other issues that I'll characterize as safety margin issues. And they are the assumption of 100 percent mortality; the assumption that there is no compensation; and the assumption that the plant is running at 100 percent flow. Do you have those issues in mind?

DR. MAYER: I do.

MR. ELLISON: With respect to those three issues, was Duke's position to agree with the technical working group in each of them in a manner that had the effect of increasing proportional mortality?

DR. MAYER: That's correct.

MR. ELLISON: So if you take the six issues together, the three disputed issues and the three safety margin issues, is it true that Duke's position was to reduce, would have the effect of reducing proportional mortality with respect to three of them, and increasing proportional mortality with respect to three of them?

DR. MAYER: That's correct.

MR. ELLISON: And is it also true that the staff's position was to -- would have the effect of increasing proportional mortality in all six cases?

DR. MAYER: That's correct, too.

MR. ELLISON: Now, she also asked you some questions as well as Mr. Naficy asked you some questions that went to whether larval production has a seasonal effect. Do you recall those questions?

DR. MAYER: I do.

MR. ELLISON: And the gist of those questions was whether the 370 million gallon per day daily average cap might not be in effect, if you will, might not limit the plant to 370 mgd on a particular day or a particular week, or perhaps even a particular season. Do you recall that?

DR. MAYER: I do.

MR. ELLISON: Okay. If you care about how the effects of the modernization would be on a particular day or a particular week or a short period of time, wouldn't the proper comparison be the capacity of the modernized plant to compare to the capacity of the existing plant?

DR. MAYER: Yes.

MR. ELLISON: What is the capacity of the existing plant?

DR. MAYER: It's 668 million gallons per day.

MR. ELLISON: And the maximum capacity of the modernized plant?

DR. MAYER: It's 370 million gallons per day. No, I'm sorry, 425 -- 475, excuse me. I apologize.

MR. ELLISON: So, if you care about the issue of impacts of cooling water use over a short period of time, over a day, a week, or perhaps a season, isn't it true that the modernization would reduce those impacts?

DR. MAYER: That's correct.

MR. ELLISON: Now, with respect to the issue of 100 percent mortality and that assumption, Ms. Holmes asked you some questions about the studies that have been done that have shown survival rates. Do you recall those questions?

DR. MAYER: I do.

MR. ELLISON: In particular she asked you questions that went to the issue of whether studies have been done to see whether the surviving larvae continue to survive in the natural environment versus in a laboratory or onsite setting, do you recall those questions?

DR. MAYER: I do.

MR. ELLISON: First of all, you recall Dr. Raimondi this morning saying that he believed, or perhaps he'd seen studies that showed that there was massive mortality of these surviving larvae. Do you recall that statement?

DR. MAYER: I do remember that.

MR. ELLISON: Isn't it true that massive mortality of larvae is normal whether they have been entrained and survived, or have not been entrained at all?

DR. MAYER: That's right.

MR. ELLISON: Secondly, would it be possible, in your opinion, to do a study that followed larvae that survived entrainment after they've dispersed into the natural environment?

DR. MAYER: I think that would be an almost impossible study even to imagine undertaking.

MR. ELLISON: Notwithstanding that, if you were to assume that you could follow these larvae after they survived entrainment, would it be possible to separate the cause of their mortality as between having been entrained versus some of the other factors that affect larval mortality in the natural environment?

DR. MAYER: I think that would be extremely difficult.

MR. ELLISON: So isn't it true that the only reasonable way to isolate the impact of entrainment on these surviving larvae would be to collect them and hold them in controlled conditions to see if they continue to survive?

DR. MAYER: Yes, I do. I think we would make every attempt to simulate in those controlled conditions ambient conditions they would experience out, away from the discharge.

MR. ELLISON: And to your knowledge, isn't that the way at least some of these studies have been done.

DR. MAYER: Yes, it's not as if somebody has -- a number of people haven't attempted to do these kind of studies, and they have used various kinds of sampling and research techniques to get at the answer. But, they, in fact, as Dr. Cowan earlier said, attempt to collect organisms, hold them for indications of latent mortality, having made the trip through the power plant.

And they try to do so in conditions at the site, to avoid transport, and to simulate as closely as they could the experience of the larvae after having made the trip through the power plant.

MR. ELLISON: That's all I have, thank you.

HEARING OFFICER FAY: Okay. Now, Ms. Holmes.

MS. HOLMES: Yes, thank you.

RECROSS-EXAMINATION

BY MS. HOLMES:

Q I think it was Dr. Cowan, might have been Dr. Mayer, a few minutes ago there was some questions about what you look at if you care about short-term impacts, do you recollect those questions?

DR. MAYER: Sorry?

MS. HOLMES: I believe that just a few minutes ago you testified that if you care about short-term impacts, what you look at is maximum capacity. Did I understand your testimony correctly?

DR. MAYER: Well, is this the redirect -- from --

MS. HOLMES: Yes.

DR. MAYER: Yes, thank you. Yes, I think, yes, to answer your question.

MS. HOLMES: Does capacity tell you anything at all about what's gone on at the plant in the past?

DR. MAYER: Capacity, the generating capacity?

MS. HOLMES: The capacity of the pumps. Does the capacity of the pumps tell you anything at all about how much water that plant actually used last year?

DR. MAYER: It indicates the amount of water that can be taken at any point in time.

MS. HOLMES: Does it indicate the amount of water that was taken?

DR. MAYER: At anytime? No.

MS. HOLMES: And, in fact, if you care about the short-term impacts, might you be interested in, for example, a situation in which the plant ran not at all last year during the months of, let's take May and June, and run at 475 million gallons per day during May and June this year? Would you be interested to know that if you were concerned about short-term effects?

MR. ELLISON: Let me clarify your question. If you were concerned about comparing just those two months versus the other two months? Or is your question if you care about short-term impacts generally?

MS. HOLMES: Well, his testimony was, or your question to him to which he responded was prefaced with the assumption if you care about short-term impacts. I'm just trying to pick up that language.

If I misstated it or misused it, you're welcome to offer a statement to correct how I'm using it.

MR. ELLISON: Well, just for the record, let me clarify what I think I meant, anyway, by my question. And then you could use that however you want. But the question that I believe I posed to him was that if you cared about comparing the change that would result from approving this project and modernizing it versus allowing the existing project to continue, if you care about the change of that on the capability of the project and the short-term impact, an impact during a particular day or week or whatever, that relevant --

MS. HOLMES: That's fine.

MR. ELLISON: The question I asked him, wouldn't a relevant comparison be the capability of each of those plants to operate for a short period of time.

MS. HOLMES: Fine, let's construct a hypothetical which is truly a hypothetical, because it probably won't happen this way. Let's assume that the old plant and its existing capacity is operating in year one. And in year two, the new plant is operating with its 370 millions of gallons per day annual cap on it.

If the last year of operation of the existing facility the plant used no water at all in the months of May and June. And in the first year of operation of the new facility, the new plant used 475 millions of gallons per day during the months of May and June, wouldn't that be an increase in impacts over that time period?

DR. MAYER: It seems to me you're asking

if the plant is on or off --

MS. HOLMES: The old plant is not operating during May and June. The next year the new plant is operating at full capacity during May and June.

Does moving to the new plant in that situation, in that hypothetical, does that create an increase in water use and an increase in impacts?

DR. MAYER: If you're asking, if you're comparing the period the plant's operating to one that is not operating, there would be impacts.

HEARING OFFICER FAY: Except for those two months in the hypothetical, May and June of the first year versus May and June of the second year, and you're saying that there would be impacts?

DR. MAYER: I'm making -- if the plant -- is the question is the plant on one year, whether it's got some capacity or otherwise, and the second year it's off, then I would presume there'd be no entrainment during that period of time, and no impacts from entrainment.

MS. HOLMES: So, in effect, the capacity numbers don't tell you anything at all, do they, about impacts?

DR. MAYER: I think that the question I was being asked --

MR. ELLISON: Before you go any further, I want to clarify this question. When you say capacity numbers don't mean anything at all with respect to impacts, do you mean with respect to the impacts of your previous question, the hypothetical you just gave him?

Or are you asking impacts generally? Or are you asking short-term impacts generally?

MS. HOLMES: I'm asking with respect to the scenario that I posited to him.

MR. ELLISON: Okay.

DR. MAYER: Well, as I said earlier, the question I was asked and answering is if on any day, taking the two facilities and comparing them with their different pump capacities, there would be a reduction in entrainment effects if both plants, plant conditions were operating at full capacity.

MS. HOLMES: But you don't know whether or not that creates a natural impact unless you know how much those plants were operating, do you, in the past and in the future, or in year one, or in year two?

DR. MAYER: The number of days, are you telling me that?

MS. HOLMES: Yes. I'm talking --

DR. MAYER: Okay. No.

MS. HOLMES: Thank you. That's my only series of questions. I thought it was just going to be one, I apologize.

HEARING OFFICER FAY: That's all. CAPE.

MR. NAFICY: I'm really fishing for that star, so I'm not going to ask any questions.

(Laughter.)

HEARING OFFICER FAY: Fine, you're doing great. We compliment you. The City?

MR. SCHULTZ: Nothing.

HEARING OFFICER FAY: Nothing, then. Okay, fine. Anything further, Mr. Ellison?

MR. ELLISON: No.

HEARING OFFICER FAY: Okay. Before we move on, I think we've got some exhibits.

MR. ELLISON: Yeah, we do need to move some exhibits here. I would move the admission of exhibit 266, which is Duke's direct testimony on aquatic biological resources.

And we're going to -- I understand

there's been a discussion between Mr. Okurowski and Mr. Fay about the appropriate way to number Duke's rebuttal exhibits. So, I'm going to ask him to describe that.

MR. OKUROWSKI: Correct me if I'm wrong, Mr. Fay, based on our conversation. But, as you and I discussed, you indicated that you would like to have all of Duke's rebuttal testimony identified by section.

We submitted one group of documents consistent of several sections.

HEARING OFFICER FAY: Right, and each section was separately paginated, so for instance, if it was rebuttal to one of CAPE's witnesses, and that was paginated 1 through whatever; and then rebuttal to a different one of CAPE's witnesses and it started again with page 1, I'd like those to have different exhibit numbers.

MR. OKUROWSKI: You also indicated that we could do a number followed by (a), (b), (c), (d) and (e) to make that easy.

So what I would propose is the following: The first is I propose that exhibit 229 be stricken, we just leave it as blank because that was --

HEARING OFFICER FAY: What page is this on?

MR. OKUROWSKI: It's not on your sheet there. Exhibit 229 was identified in the hearing as the rebuttal testimony to alt cooling.

HEARING OFFICER FAY: Okay.

MR. OKUROWSKI: And if we're going to make it all one, we need to make that a blank, because we also identified exhibit 200 as the rebuttal to terrestrial biology.

So what I propose is that we just leave exhibit 200 as rebuttal to our testimony, and we break it out as follows:

200(a) will be our rebuttal to Naficy, including the attachments that are a part of that rebuttal.

MS. HOLMES: Can you identify those, please. I'm sorry, my stuff is a little bit out of order.

MR. OKUROWSKI: Absolutely. According to my notes I have that we also attached the Water Board Staff's report; and we also attached a letter to the Water Board, which also contained attachments. So there were two attachments, and one of those attachments had sub-attachments.

HEARING OFFICER FAY: I'm sorry, that's not going to work. We're going to have to have a separate number for each of those attachments.

The Water Board report is very likely to be referred to repeatedly, and I think it needs a separate exhibit number.

MR. OKUROWSKI: Okay. Can we have it listed in two places, and just have it be a separate number?

HEARING OFFICER FAY: Sure, that's fine.

(Parties speaking simultaneously.)

HEARING OFFICER FAY: Okay, as long as somebody else is going to identify it --

MR. OKUROWSKI: Sure.

HEARING OFFICER FAY: -- by a separate exhibit number.

MR. OKUROWSKI: So that would be 200(a).

HEARING OFFICER FAY: And 200(a), again, the Water Board attachment.

MR. OKUROWSKI: It's the rebuttal to Mr. Naficy's testimony, or CAPE's testimony prepared by Mr. Naficy. And included on that rebuttal were two attachments. One was the Water Board Staff report that we attached in its entirety. And the other was a letter that we wrote to Mr. Briggs, I believe it was dated May 23rd. And in that letter there were also attachments. So that's 200(a).

200(b) would be applicant's rebuttal to the testimony proposed by Mr. Wagner and Laurie.

MS. HOLMES: Can you hold on for a second? I'm sorry. The Regional Board obviously is going to be talking about its own report, and we would expect to have that numbered at that time. But that leaves Duke's letter to the Regional Board, which was the second attachment to 200(a), without a number. And I think that ought to have a number.

MR. OKUROWSKI: I propose after we're finished going through these we also identify that as a separate number, as well.

MS. HOLMES: So it will just be later on?

MR. OKUROWSKI: Yeah, I just don't want to break that up, and then get confused on that one later.

MS. HOLMES: Thank you.

HEARING OFFICER FAY: Just because it was filed at one time.

MR. OKUROWSKI: Right, it was filed at one time.

HEARING OFFICER FAY: Okay.

MR. OKUROWSKI: So, 200(b) is the rebuttal to the testimony of Messrs. Wagner and Laurie. 200(c) should be rebuttal to the testimony of Mr. Stephens, or is it Dr. Stephens, I believe.

200(d) should be the rebuttal testimony to Dr. Henderson that he prepared for marine biology; there are two testimonies, so the first one, the letter (d) is known as marine biology testimony.

200(e) would be rebuttal to the testimony prepared by Mr. Powers on alternative cooling options.

And then 200(f) is our rebuttal testimony to Mr. Henderson on Gunderboom. And if I can have a minute to speak with Mr. Ellison for a second, I'd appreciate it.

HEARING OFFICER FAY: Go ahead.

(Pause.)

MR. ELLISON: Mr. Fay, the question that Mr. Okurowski was asking me is we understand that Dr. Henderson is going to be allowed, because of the distance of his travel, to present his Gunderboom testimony today.

So the issue is should we admit Duke's rebuttal to his Gunderboom testimony today, as well. Or should we save it for when the rest of the Gunderboom testimony will come in. We don't care.

HEARING OFFICER FAY: Okay, why don't you admit it today.

MR. ELLISON: Okay.

HEARING OFFICER FAY: And then you can use that exhibit number when you address it later.

MR. ELLISON: That's fine. Okay, with that understanding then, Duke will move for the admission into evidence of exhibit 266 and the exhibits incorporated by reference therein.

Because they are numerous, in the interests of time we have handed out a sheet to all the parties that has all the incorporated exhibits, and proposed exhibit numbers for them, and we will not go through it orally.

HEARING OFFICER FAY: But they're listed in the prefiled testimony, correct?

MR. ELLISON: That's right; they are listed in the prefiled testimony. All we've done is to take that list in the prefiled testimony and assign exhibit numbers to it so that we can save the time necessary to do that.

So, with that we would move exhibit 266 and all of the exhibits incorporated by reference therein, including an amendment, which are listed on the sheet handed out with the appropriate numbers.

MS. HOLMES: Did I miss your identification of your rebuttal to the Regional Board and the City of Morro Bay? I didn't hear that those got numbers.

MR. ELLISON: Not there yet.

MS. HOLMES: Not there yet.

(Laughter.)

MS. HOLMES: Moves in mysterious ways.

HEARING OFFICER FAY: And are you also moving exhibits 200(a) through 200(f)?

MR. ELLISON: Not yet.

HEARING OFFICER FAY: Okay.

MR. ELLISON: Well, we can do -- okay, let's do it all together. We're going to move 266 and exhibits incorporated by reference therein, and those portions of exhibit 200 that relate to aquatic biological resources, as well as 200(f) which is our rebuttal to Dr. Henderson on the Gunderboom.

HEARING OFFICER FAY: Okay. Is there objection? All right, hearing none, so moved. And this will be reflected in Mr. Okurowski's summary of the exhibit list he'll send to the parties.

And also, can you get either a copy or a list to the court reporter at your convenience so that he'd got this.

Okay, --

MS. HOLMES: I apologize for my lack of understanding of this, but we still don't have the letter of Duke to the Regional Board and Duke's rebuttal to the City and Duke's rebuttal to the Regional Board. I just want to know what's happening with these documents and when they're coming in.

MR. ELLISON: We should clarify. We did just move them, if you want to go back and revisit that if you have a concern.

MS. HOLMES: They didn't get a number.

MR. ELLISON: Oh, a separate number?

MS. HOLMES: Well, that's what Mr. Fay was suggesting.

MR. ELLISON: All right, I apologize.

HEARING OFFICER FAY: What I heard Duke

say is that they either plan to later bring it up again, or they had no objection to somebody, for instance in the case of the Water Board report, re-entering that item --

MS. HOLMES: Well, if Duke doesn't want to enter their rebuttal to the Regional Board's report, that's fine with us. We won't move it in.

MR. ELLISON: No. Here's what I think we just did, and if you want to back up, we can.

I moved exhibit 200 and all of the portions related to aquatic biological resources.

MS. HOLMES: My point is they don't all have numbers yet.

MR. ELLISON: I understand. Here's the problem. The problem is that the way Duke's rebuttal is organized is not by topic, but by who we are rebutting. We have organized it with numbers based on that, because that's the way it's paginated.

So, for example, 200(b) is our response to Laurie and Wagner, okay.

What I moved into evidence was all of those portions of 200, including all the subcategories of it, that relate to aquatic biological resources. So to be specific, that motion was meant to include the Regional Board Staff report, our letter, and the rebuttal thereto, which I understand we also want to number separately. But we are moving that now as part of our direct.

MS. HOLMES: Well, can we know what numbers they're going to have, as they don't have numbers now?

MR. ELLISON: Let's call them 267 and 268.

MS. HOLMES: Okay, which is which?

HEARING OFFICER FAY: Yeah.

MR. ELLISON: Staff report would be 267.

MS. HOLMES: Okay.

MR. ELLISON: Our rebuttal will be 268.

MS. HOLMES: Okay. And what about --

MR. ELLISON: I'm sorry, our letter to the Regional Board will be 268.

MS. HOLMES: And then what about your rebuttal, which doesn't have a number yet?

MR. ELLISON: Well, specifically it would be 200(a), right?

MS. HOLMES: No, you already identified 200(a).

MR. OKUROWSKI: 200(a) is the rebuttal

to Mr. Naficy.

MS. HOLMES: Yes.

MR. OKUROWSKI: 200(b) is the rebuttal to Messrs. Wagner and Laurie. 200(c) -- keep going?

MS. HOLMES: Is the rebuttal to Stephens.

MR. OKUROWSKI: Okay, Stephens. 200(d) is the rebuttal to Henderson on marine biology. 200(e) is the rebuttal to Powers on alternative cooling. 200(f) is the rebuttal to Henderson on Gunderboom.

MS. HOLMES: And where is the rebuttal to the Regional Board Staff report?

MR. ELLISON: Let's do this --

MS. HOLMES: I'm sorry, can we go off the record?

HEARING OFFICER FAY: Don't apologize.

MR. ELLISON: Now, --

MS. HOLMES: I mean I have a document entitled Rebuttal testimony; we referred to it this morning; and it has no number and nobody's moving it into evidence.

MR. ELLISON: Okay, let's do this. Let's number 200(a) will be the rebuttal to Mr.

Naficy. 267 will be the staff report. 268 will be the letter. 269 will be Duke's rebuttal to the staff report.

We will move the following things: exhibit 266 and the exhibits incorporated by reference therein. Exhibit 200(a) through (f) to the extent that it addressed aquatic biological resources. And exhibits 267, 268 and 269.

HEARING OFFICER FAY: Okay, with that understanding, and stop me if you don't have an understanding, but with that understanding is there objection? I hear none, so we're going to enter those into the record as labeled.

MS. HOLMES: Did we want to get an exhibit number for the PowerPoint that Duke passed around this morning. I believe earlier this morning you suggested --

HEARING OFFICER FAY: Yes, thank you, Ms. Holmes, I appreciate that. That will be exhibit 270. The PowerPoint presentation, the first box of which says Duke Energy Morro Bay LLC Marine Biological Resources, June 6, 2002, Dave Mayer, Tenera Energy.

And with that, we're going to take a ten-minute break, and we're going to start in exactly ten minutes with Ms. Holmes' presentation.

(Brief recess.)

MR. ELLISON: Thank you, Mr. Fay, I do have two quick housekeeping items before we turn to the staff's testimony.

And the first is that I believe it was yesterday, sometime this week CAPE asked the question regarding what the capacity factor of the plant has been so far this year. And we agreed to provide that number.

That number, through the first four months of this year, is a 21 percent capacity factor. All the units with the exception of unit 2 have been down for maintenance at some period of time during those four months.

HEARING OFFICER FAY: So that's from the beginning of the year to this time?

MR. ELLISON: That's correct.

The second issue is we have a overhead of the model grid that was used yesterday during the discussion of alternative cooling, that has the grid system and it could be used in conjunction with the transcript to follow the discussion yesterday, at your request, Mr. Fay.

I would suggest we give this an exhibit

number next in order.

HEARING OFFICER FAY: That would be exhibit 271.

MR. ELLISON: Okay.

HEARING OFFICER FAY: Have you served copies of that, or --

MR. ELLISON: We have copies for everybody that we'll pass out right now.

HEARING OFFICER FAY: Okay. And you'll docket that?

MR. ELLISON: We will. That's all I have, thank you.

HEARING OFFICER FAY: Okay. Ms. Holmes.

MS. HOLMES: Thank you.

The witnesses for aquatic biology are Dick Anderson and Andrea Erichsen who have already been sworn. And Mr. Thomas from the Regional Board and Dr. Raimondi have not, and do need to be sworn at this time.

HEARING OFFICER FAY: Please stand and be sworn in.

Whereupon,

RICHARD ANDERSON and ANDREA ERICHSEN

were recalled as witnesses herein, and having been previously duly sworn, were examined and testified further as follows:

Whereupon,

MICHAEL THOMAS and PETER RAIMONDI

were called as witnesses herein, and after first having been duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

BY MS. HOLMES:

Q First, Mr. Anderson and Ms. Erichsen, did you prepare the aquatic biology sections of the FSA and the rebuttal, which have been identified as exhibits 197 and 198?

MR. ANDERSON: Yes.

MS. ERICHSEN: Yes.

MS. HOLMES: And was a statement of your qualifications included in exhibit 197?

MS. ERICHSEN: Yes.

MR. ANDERSON: Yes.

MS. HOLMES: Thank you. And, Mr. Thomas, was what has been identified as exhibit 267, which is the staff report for regular meeting of May 30, 2002, prepared by you or under your direction?

MR. THOMAS: It was prepared mostly by me; some of the language is from other staff at the Regional Board, including legal counsel. But, yes, most of it was my own.

MS. HOLMES: Thank you. And could you briefly describe your qualifications and what your job responsibilities are.

MR. THOMAS: Sure. I'm a Program Manager, Project Manager for the Regional Water Board. This is one of my projects, the Morro Bay Power Plant Modernization Project, that is, is one of my projects.

I have a bachelors of environmental engineering from the University of Florida. I have about 13 years of experience with the Regional Board overseeing several different projects, power plant projects like this one, the Diablo Canyon Power Plant project, Morro Bay and Moss Landing. And as well as several investigation and cleanup type projects for the Regional Board.

MS. HOLMES: Thank you. I'd just note for the record that subsequent to the issuance of the staff report, exhibit 267, there was a supplemental sheet passed out. I don't believe that it's necessary to mark that and admit that, but if anybody else has a different opinion I'd be happy to reconsider.

Hearing no objection, -- the next thing we need to do is to have Dr. Raimondi's testimony identified as an exhibit.

HEARING OFFICER FAY: Could you identify it, please?

MS. HOLMES: It's entitled, Review of Dr. James Cowan's report for Duke Energy, titled entrainment mortality in the Morro Bay Power Plant Modernization project, technical comments and ecological context review, submitted by Peter Raimondi, Ph.D., University of California at Santa Cruz, May 21, 2002.

HEARING OFFICER FAY: That's exhibit 272.

MS. HOLMES: Thank you.

Dr. Raimondi, did you prepare exhibit 272?

DR. RAIMONDI: Yes, I did.

MS. HOLMES: And can you give a brief summary of your qualifications?

DR. RAIMONDI: I have a Ph.D. in marine ecology from University of California at Santa Barbara. I'm a professor of marine ecology at University of California at Santa Cruz.

I've worked on many of the power plant 316B studies, most of them, for the last ten years. I'm on a Scientific Advisory Panel to the California Coastal Commission for the mitigation effort at San Onofre nuclear power generating station. And I've been involved with these sort of mitigation -- not mitigation, but assessment efforts, as I said, for about ten years now.

MS. HOLMES: Thank you. And I'd like each one of you to answer the following three questions in sequence. Are the facts contained in your testimony true and correct?

MS. ERICHSEN: Yes.

MR. ANDERSON: Yes.

MR. THOMAS: For the most part, yes. There is a correction that Duke Energy made and --

MS. HOLMES: This would be a good time to point it out.

MR. THOMAS: There's a correction on the volume of water that we used to calculate -- or that I stated was used to calculate the entrainment losses. I said it was 427 million gallons per day; Duke Energy corrected that, it's actually 413. I believe that was the number that was used to calculate the results.

MS. HOLMES: And that would be a change that goes throughout exhibit 267?

MR. THOMAS: My staff report?

MS. HOLMES: Yes.

MR. THOMAS: Yes.

MS. HOLMES: Thank you. And with that correction, are the facts contained in your testimony true and correct to the best of your knowledge?

MR. THOMAS: Yes.

MS. HOLMES: And, Dr. Raimondi?

DR. RAIMONDI: Yes.

MS. HOLMES: And, Mr. Anderson and Ms. Erichsen, do the opinions contained in your testimony represent your best professional judgment?

MS. ERICHSEN: Yes.

MR. ANDERSON: Yes.

MS. HOLMES: Mr. Thomas?

MR. THOMAS: Yes.

MS. HOLMES: Dr. Raimondi?

DR. RAIMONDI: Yes.

MS. HOLMES: Thank you. What I'd like to do now is to have staff prepare a brief summary of its testimony, and then have each of the other two witnesses provide a summary of their own.

So, beginning with that, staff will offer a summary of the FSA.

MR. ANDERSON: I'll start. I just want to remind everybody that Morro Bay is a national treasure. It's been designated a state and a national estuary. And agencies are required to implement the utmost protection of this resource; that's found in Clean Water Act, section 320.

Staff finds that the proposed once-through cooling system will cause direct significant adverse impacts on the Morro Bay estuarine system.

The proposed once-through cooling system, if approved, would continue to impact the estuary for up to 50 years. That's considering the life of the project is 50 years. I'm assuming it is.

There are cooling options and mitigation combinations that could reduce or avoid significant impacts of once-through cooling, such as dry cooling, or greatly reduced once-through cooling in combination with dry cooling.

One 600 megawatt facility could be built to use once-through cooling; one could be built to use dry cooling. There's all kinds of combinations like that. We list a few in our FSA.

Staff recommends that the Energy Commission license the Morro Bay Power Plant project only with mitigation that significantly reduces or avoids the proposed once-through cooling.

And staff's preferred option is dry cooling, because it eliminates the impacts of once-through cooling.

That's all I'm going to say right now, and we'll turn it over to, I believe, Michael Thomas first, and then Dr. Raimondi.

MR. THOMAS: Okay. I just have one slide and I'm going to very briefly summarize our staff report. As you can see, it's about 20 pages long. I'm going to go through it very quickly, just hit the major points.

As I stated earlier today, we consider the impingement loss rates or the impingement impacts to be relatively minor. We also consider the thermal effects to be not unreasonable considering what it would take to eliminate those impacts.

We do consider the entrainment impacts

to be important. I put a little red star in there to remind me that this morning I said that they were significant. And I tend to use that word not in the same context that it's used here. So I wanted to point that out, that I use important or significant; I use them interchangeably and I don't mean to use that in a CEQA context. So I changed that to important to better reflect the staff report.

The Regional Board and independent scientists believe that the best estimate of entrainment loss for estuarine taxa is 17 to 33 percent. They've also stated that the upper end of that range is most valid. And Dr. Raimondi submitted testimony to that effect. And he will speak to that after I'm finished.

These numbers are based on the flow rate. And as I mentioned earlier, the staff report does contain an error. I said in the staff report that the flow rate that these numbers were based on was 427 million gallons per day. It's actually 413. You get different results if we use different numbers.

Duke Energy has proposed the 370 million gallon per day limit as an annual daily average.

And if we use that number you'll get different results. If we used higher numbers, if you use 475, you'll get higher results.

Staff and the independent scientists do acknowledge the weighted average approach; it's included in our staff report. We do not agree, and have not agreed, that that is the best approach, or is the most appropriate. Dr. Raimondi will address that, as well.

The Clean Water Act, section 315B, discusses the importance of estuaries and the importance of impaired water bodies. So we have that to consider in our analysis and in our approach. Estuaries are important; they are sensitive. We agree with the EPA on that.

We also agree that the entrainment impacts need to be considered in light of the other impacts that are occurring on the estuary.

Morro Bay is an impaired water body. It's on the Regional Board's Clean Water Act section 303D list for impaired water body.

And Morro Bay is a national estuary, as the CEC Staff have pointed out, and we recognize the importance and the need to protect the Morro Bay estuary as a national estuary.

And our conclusion is that entrainment should be addressed. We have a recommendation in the staff report. I won't discuss it because, as I understand it, that will be dealt with at a later hearing.

So with that I'll turn it over to Dr. Raimondi and he will discuss his testimony that was submitted to the Energy Commission.

We have to switch computers.

HEARING OFFICER FAY: And just for clarification, did that come in in any process other than one of CAPE's attachments? I know CAPE attached it to their testimony.

MR. THOMAS: Did what come in?

HEARING OFFICER FAY: Did Dr. Raimondi's rebuttal testimony --

MS. HOLMES: I believe you submitted a letter to the Energy Commission that contained your staff report, the supplement to the staff report and Dr. Raimondi's testimony.

MR. THOMAS: Yes.

MS. HOLMES: I do not know whether it was docketed or not.

HEARING OFFICER FAY: Okay.

MR. THOMAS: I submitted it to your

docketing --

MS. HOLMES: Okay, then it was docketed.

MR. THOMAS: -- office --

MS. HOLMES: Or should have been.

MR. THOMAS: -- or department.

HEARING OFFICER FAY: And do you know what day that was submitted on?

MR. THOMAS: I don't off the top of my head.

HEARING OFFICER FAY: Okay. Could I ask staff to take responsibility for being sure that those two documents, and those are Dr. Raimondi's rebuttal is exhibit 272, and the Water Board Staff report is exhibit 267, that both of those get docketed, as labeled, with exhibit label on it, and filed that way?

MS. HOLMES: Yes.

HEARING OFFICER FAY: Thank you.

MR. THOMAS: I believe they were mailed on May 24th.

DR. RAIMONDI: Following a suggestion this morning I've taken some of my comments out of the presentation. I'm just going to go over some of the major disagreements that we had with the Duke/Cowan report. There's just three terms.

And, again, these are just fundamental disagreements; they don't represent anything more than that, any acrimony among us. And I just want to go over these.

The main disagreements with the report are the use of weighted versus simple averages. The separation of bay and coastal habitats for the purpose of effect estimation. And the use of the mean versus the maximum periods of exposure to larval entrainment. And I'll go over each of those in turn.

The first is, and this is a simple one to dismiss, the use of weighted versus simple averages. And I think that there's been sort of a misunderstanding between us about whether there was an agreement or not.

In my opinion it's a matter of the question that you're asked. If the question is what is the larval loss for fish, if that's the extent of your question, you should use weighted averages. I have no disagreement with that. I think that Jim's absolutely right, that would be the fundamentally sound way to approach this question. Use weighted averages.

Because the vast majority of the things

that we're counting were the sampled fish in the entrainment study. And if you're interested in the fish, alone, then you should weight them by their abundance; that's the only reasonable way to go about.

If, on the other hand, and this is, I think, the source of the misunderstanding, if, on the other hand, you're taking the approach as we were doing, that these things we were counting in the target organisms were proxies for all the organisms that we could not sample, those things like invertebrate larvae, other than crabs, algaspore, seagrass seeds, zooplankton, phytoplankton, anything else that could have been entrained, then our approach has been to use simple averages.

So, it's really a matter of the question. And I'll just leave it at that. And our approach and what we are doing is to use the second thing, which is to use those data that have been collected as information that is informative for all the rest of the things that we weren't able to collect information for.

The second question is the separation of the bay and coastal habitats for the purpose of effect estimation. This is the table that was presented earlier, that I presented earlier. And I've added a column down here, or a row down here just so that you can see that I put in the 10 percent that Duke has advocated.

And, again, what -- down here, is that if you look at the average of all the estuarine species you come up with about 33 percent. And if you look at the average for all the coastal species, you come up with about e percent. And only here, for reasons that we can get into if you really want to, but only here, under the mean, the average period at risk can you get a combined rate. And that's about 10 percent.

The point I want to make is that I think that part of the confusion and the disagreement among us about what to use with respect to bay versus coastal, is because we have a fundamental misunderstanding about what's the appropriate currency to use.

Percentages, in my opinion, -- I went over this earlier, but percentages, in my opinion, are not a good currency because they don't mean anything to anyone.

And if you turn it into the area from

which production has been lost, then it simply does not matter. You can use the 10 percent or you can use what we've done, which is the 3.1 and the 17.2 percent. And both of those give you the equivalent result, the same result. And that is that if you use the 17 percent approach, which we have done, plus the 3 percent, you come up with an effect of 380 acres and about two miles.

If you use a 10 percent, which Duke has advocated, by combining the two, you come up with an effect of 380 and two miles. They're functionally equivalent.

And so I think this disagreement goes completely away when you turn it into the currency that is easy to understand, which is how much area has production been lost from. And the fundamental disagreement, then, comes from the next issue, which is the use of the mean versus the maximum periods of exposure to larval entrainment.

And I'm going to go over this in just a little bit of detail and then we'll be done, maybe five more minutes.

This is the figure that I showed earlier. I'm just going to go over this in a little bit of detail. There's the age of fish in entrainment, and I think that this has been shown in another form by Duke.

There's the frequency distribution that lists what percentage of fish were collected that were day one fish, day two fish, day three fish and so on.

This is the mean, four days. This is the statistical maximum, and this is the dispute between the mean and the statistical maximum, four days versus 11 days here.

Here is the underlying assumption behind both of these. If you look at the age of fish at entrainment versus the risk of entrainment, we are both assuming, whether you're Duke or whether you're us, that there is a flat rate. That you're equally susceptible at age one, age two, age three and age four, five, six, seven, eight, nine, through 11.

The fundamental disagreement is when you're no longer vulnerable. We say that you're equally vulnerable regardless of age up until the age 11. And then, poof, you're not vulnerable anymore in this hypothetical case.

Duke is saying, no, it's the mean;

you're vulnerable until the age of four, and then you're no longer vulnerable up to the mean.

The problem is, and the argument that was presented earlier by Cowan is exactly right. The real question, the question that we wish we could have addressed, and has been addressed a little bit, is whether there is a differential susceptibility as a function of age.

And so here's the graph just repeated again, and the potential solution is it estimates susceptibility as a function of age. That would really get at the crux of the issue that separates the two sides.

And what we're really saying is that susceptibility looks something like this. That when you're very young it's high; it decreases over time until age 11, it's essentially zero. At age 11 you're no longer vulnerable, but it decreases in some function -- this is just a hypothetical function -- it decreases, in this case, in a negative exponential function.

And so what this says is you're not equally susceptible at age one, two, three, four through 11. You're most highly susceptible at age one; and then a little bit less at two and three and four. And by the time you're to age 11, you're no longer susceptible.

And if we could model this out, or actually figure this out, then this would be the best approximation for the mortality estimates.

And so what we did is we came to an agreement about a method that would allow us to do this, in principle, for the only species where there was enough data to do that with. And that was the gobies.

And so there's enough data available to actually take this approach for the gobies. And so here is the mean estimate of proportional mortality which was 11 percent for gobies. Here's the maximum percentage, 43. So if you base upon maximum duration it's 43; if you base upon mean duration it's 11 percent.

If you do the method, the recalculation method, it takes into account differential susceptibility over the age of the fish, it's 38 percent. And this an agreed-upon method. We went through the exercise; it's 38 percent.

Now, here's the problem. See, we've got three methods now. We've got a mean method; we've got a maximum method; and we've got a recalculated method, but the recalculated method can only be done for gobies.

So what do we do for all the other species? Should we take the recalculated method for gobies and combine it with the means for all the other species? Or should we take the recalculated method for gobies and combine it with the max? Or should we just go with the max? Or should we just go with the mean?

We're supporting the idea that since we can only do it for one species, and this one species is closer to the max, in fact way closer to the max than it is for the mean, then the only reasonable approach is to use the maximums, because we have no ability to do this recalculation for the other species.

And so that's the approach that we've taken is to opt for the maximum value here.

And so, we disagree in all the cases with this. I think they are reasonable scientific differences. We think that simple averages are the right way to go because we're considering all species that are lost.

We think that there's really no real fundamental difference of opinion here when you look at it in the correct currency, which is the amount of area from which production has been lost. And we think, for the reasons I just suggested, that the maximum period of exposure is the most appropriate method of estimation.

And with that, I'm done.

HEARING OFFICER FAY: Does that finish your panel?

MS. HOLMES: Yes, it does. I'd just like to ask one question, I think, for purposes of the record.

Dr. Raimondi, you talked about the fact that there is a difference between using weighted and simple averages depending on whether you were looking at a certain number of individual fish species and whether you were looking at a broad range of species.

Can you explain why weighting is inappropriate, or why you believe weighting is inappropriate when you're looking at a broad range of species?

DR. RAIMONDI: Yes.

MS. HOLMES: I'm not sure that came through.

DR. RAIMONDI: And it may not have.

Okay, let me go back a bit.

These are the species, the fish species from which we were able to obtain reasonable estimates of mortality rates, some of them for both maximum and for mean.

These have very different life -- well, they don't all have, but there's a variety of life histories that are involved in these species. All life history means where they live, how many babies they produce, how long in the larval period, when they come back, what types of larval behavior they have, how big the babies are, how many of them, all those sorts of things are considered life history.

And marine organisms have a variety of life histories. These are the ones that we sampled, which are all fish species. The vast majority of fish are encompassed in these ones that we actually have sampled.

And so for fish, these are absolutely the most reasonable estimators of what fish losses are. And I think, quite reasonably, you should weight the ones, the fish species that is most abundant in the entrained population, to get the average.

Now, the next up is the extrapolation to all the other species. And if you use the weighted average, then what you're basically assuming, and we're not willing to do this, what you're basically assuming is that unidentified gobies have essentially the predominant life history of all the other species. That they're representative of all the other species, because we're weighting them most heavily.

And there's absolutely no reason to make that assumption, in my opinion. They're not representative of invertebrates; they're not representative perhaps of algaspores; they're not representative of zooplankton or phytoplankton. We simply don't know what they're representative of and what they're not representative of.

What we do know is there's a broad range of life histories that are accounted for in these species. And that they're probably as broad a range as you might find in these other things that we were unable to sample.

And so it only makes sense to us, and the approach we took was to say, all right, these encompass life histories of the other species, we shouldn't weight them; we just should say they encompass the other life histories, and we'll take the simple average of those to come up with an approximation for the other species.

MS. HOLMES: Thank you, Dr. Raimondi. With that, the witnesses are available for cross-examination, unless you'd like us to -- are we introducing the exhibits at this point?

HEARING OFFICER FAY: Yeah, why don't you do that. Why don't you move the exhibits now.

MS. HOLMES: We have the aquatic biology portions of 197 and 198; the Water Quality Control Board Staff report, which is exhibit 267. And Dr. Raimondi's rebuttal testimony to Dr. Cowan, which is exhibit 272.

When I reviewed my notes last night it appears that we may not have moved in staff's testimony on cooling options yesterday. So, I'd like to, at this time, if we haven't, do it again. The cooling options portions of exhibit 197 and 198. And exhibits 230 and 231, which were identified yesterday.

HEARING OFFICER FAY: I'm sorry, I missed the last part. Which is what?

MS. HOLMES: 230, which was the ambient air temperature study; and 231, which was the additional visual analysis.

HEARING OFFICER FAY: Okay. Is there any objection? All right, those are moved at this time.

And the panel is available for cross-examination?

MS. HOLMES: It is.

HEARING OFFICER FAY: Mr. Ellison. Oh, before we start, Mr. Ellison, Dr. Raimondi, where did these PowerPoint items appear? I don't see them in your testimony or in the Water Board Staff report.

DR. RAIMONDI: They appear in here.

HEARING OFFICER FAY: That's it, huh?

(Laughter.)

HEARING OFFICER FAY: All right, can you -- Ms. Holmes?

MS. HOLMES: Yes.

HEARING OFFICER FAY: Can you take the responsibility for --

MS. HOLMES: -- make sure that --

HEARING OFFICER FAY: -- getting that --

MS. HOLMES: Yes.

HEARING OFFICER FAY: -- the PowerPoint presentation, all the plates, printed up and served. And we will identify that as exhibit 273, Water Board PowerPoint presentation.

MS. HOLMES: Okay, did you want the Water Board? I believe Mr. Foster had one or two slides. Do you want them all together as exhibit 273, as well as Dr. Raimondi's?

HEARING OFFICER FAY: How many slides did you have, Mr. Thomas?

MR. THOMAS: This morning or just now?

HEARING OFFICER FAY: No, I wasn't thinking of this morning's. Let's just make it Dr. Raimondi's PowerPoint presentation, okay? Because it had the technical information.

Okay, Mr. Ellison.

MR. ELLISON: Thank you. Let me begin with what may or may not be a housekeeping matter, but it occurs to me that it would be useful for the Commission to understand what the impact on the proportional mortality numbers are if you were to -- if they were to decide in favor of Duke on any one of the three issues, but not the other two. In other words, to segregate the impact with respect to each of them.

And rather than taking up cross-examination time, let me ask whether this is a reasonable approach. And I would be interested in hearing from staff's panel, as well as my own panel.

What I would propose, I believe this is not a matter of dispute, what the impact would be. I believe it's straightforward, just do the math, is that right?

Okay, do you think, Dr. Raimondi, that there'd be any dispute about that? Can I just ask that Dr. Raimondi and Dr. Mayer, and if there are others who want to get involved, that's fine, agree upon that, and submit an exhibit to the Committee so that you would know? Is that a reasonable approach?

HEARING OFFICER FAY: Ms. Holmes, is that -- submit a joint filing?

MS. HOLMES: That's fine.

HEARING OFFICER FAY: I'd just remind everybody to be sure their mouth is close to the microphone when they speak, otherwise the record just loses you.

What was the response?

MS. HOLMES: I said that's fine.

HEARING OFFICER FAY: That's fine. Okay. What's a reasonable time on that?

MR. ELLISON: Next week.

HEARING OFFICER FAY: Okay. Let's say ten days, get it in within ten days.

MR. THOMAS: Can I ask for a clarification of what it is that you expect to be turned in as an exhibit?

MR. ELLISON: Well, what I'm looking for is if you were to take each of the three disputed issues, we know the record has in it what the result is if you decide all three of them in the way that staff would decide them; and if you decide all three of them in the way that Duke would decide them. We have those.

What we don't have and what I'm suggesting the Committee might want, is to segregate them. So what would be the impact on proportional mortality if you took Duke's position on one of them, and the staff's position on the other two.

So, I'm looking for -- needs to be more precise -- what I'm looking for is if you're willing to take your proportional mortality and say, if we were to adopt Duke's position on the issue of weighted average versus arithmetic, this is how our position would change. And then go back and say, if you're to take Duke's position only on the second issue, this is how it would change. If you take Duke's position only on the third issue, this is how it would change.

MS. HOLMES: Did I understand, Dr. Raimondi, correctly, that it would be difficult with respect to the second item?

DR. RAIMONDI: We may not agree on the second item for the reasons that I said earlier. The first and the third, easy.

MS. HOLMES: So the first and the third are easy; and the second, we'll see if there's agreement or not. All right, that's fair enough, I think.

HEARING OFFICER FAY: Okay, and who's going to file that?

MR. ELLISON: We'll file it.

HEARING OFFICER FAY: Okay.

MR. NAFICY: Excuse me. I was hoping that we would get a chance to, I mean we don't necessarily need to be involved in the discussion, but at least have a comment on it. In the way that they set some time for us to evaluate and come --

HEARING OFFICER FAY: Well, why don't we

get the applicant to file it, and they can indicate in the filing the extent of the buy-in they've got from the Water Board. And then parties can comment on it in their briefs. I mean this will be coming in next week, you say?

MR. ELLISON: Yeah. No, I don't have a problem with having CAPE having an opportunity to comment on it. And I don't view this as compromising anybody's position on anything. This is just a stipulated -- this is what the impact would be if you decided it different ways, that's all.

Okay, thank you for that.

CROSS-EXAMINATION

BY MR. ELLISON:

Q Let me begin with Mr. Thomas, briefly. Mr. Thomas, I believe that you described that in your slide the technical working group had determined that the impingement was biological significant, I forget the exact words that you used, is that correct?

MR. THOMAS: I wouldn't say the technical working group decide that, because I don't want to speak for the Energy Commission Staff or staff of other agencies. I would say that the Regional Board Staff and the Regional Board's consultants concluded that it was of relatively minor importance, that's the language I used.

MR. ELLISON: Okay, and when you say Regional Board's consultants that would include Dr. Raimondi?

MR. THOMAS: Dr. Raimondi and Kaia.

MR. ELLISON: Okay. The baseline that you used for that assessment was impingement, at least what I would characterize as an absolute baseline, in other words, is it having an impact compared to no plant being there a tall?

MR. THOMAS: I didn't even use the word baseline or the concept of baseline. I just looked at the absolute amount of entrainment that occurred.

MR. ELLISON: You meant impingement, correct?

MR. THOMAS: The absolute amount of impingement that occurred, yes.

MR. ELLISON: So you are not comparing the impingement of the existing plant to the impingement from the new plant, you were just looking at impingement in the absolute sense?

MR. THOMAS: Yes.

MR. ELLISON: Okay. Is it not true that one of the impacts of modernization would be to decrease the flow velocities across the traveling screens?

MR. THOMAS: If the velocities, or if the volume decreases, I would expect the velocities to decrease. Whether that will result in a decrease in impingement or not, it may or may not. It depends on other factors such as the loading of debris on those screens. I think that the loading of debris is probably the main variable that determines impingement rates for organisms.

So if the loading is high, if the loading of debris is high then impingement would be high. But in a general sense, I think it's, you know, maybe it will decrease.

MR. ELLISON: Is it fair to say that if you're comparing the existing plant to the modernized plant, that the changes being made as part of modernization are beneficial with respect to impingement?

MR. THOMAS: They may be.

MR. ELLISON: Okay. They're certainly

not any worse, are they?

MR. THOMAS: I would not expect them to be worse.

MR. ELLISON: And with respect to thermal effects, the Regional Board Staff's position with respect to those was I believe you used the words not unreasonable, or something to that nature, correct?

MR. THOMAS: Not unreasonable.

MR. ELLISON: And again, this was not a baseline kind of analysis. This was an absolute assessment, correct?

MR. THOMAS: Yes.

MR. ELLISON: What is the effect on formal discharge of the modernization compared to the existing plant?

MR. THOMAS: I don't think there would be a difference.

MR. ELLISON: Do you have your staff report?

MR. THOMAS: Yes.

MR. ELLISON: Let me ask it this way, isn't it true that as a result of the modernization that the permitted amount of difference, thermal delta, if you will, will go from 30 degrees to 20 degrees?

MR. THOMAS: The maximum allowable?

MR. ELLISON: Correct.

MR. THOMAS: Yes.

MR. ELLISON: Okay. So at least in that sense that's an improvement with respect to thermal impact?

MR. THOMAS: It's an improvement on paper. I don't believe it will be an improvement in the field because the actual discharge temperature is much less than 30. I believe it's currently less than 20.

MR. ELLISON: Okay. If you look at the permit levels they're gong down, that's correct, right?

MR. THOMAS: The maximum permitted level?

MR. ELLISON: Maximum permitted levels as a result of itemization will go from 30 degrees to 20 degrees?

MR. THOMAS: Yes.

MR. ELLISON: If you look at actual historic thermal effect of the existing power plant to what you project for the new power plant, do you project an increase in thermal discharge?

MR. THOMAS: No.

MR. ELLISON: Okay. And let me ask with respect to those questions, Dr. Raimondi, do you agree with that?

DR. RAIMONDI: I do.

MR. ELLISON: I want to ask you a question, Mr. Thomas, with respect to Water Code section 13142.5(b), which is cited in several places in the Energy Commission Staff report. Are you familiar with that section?

MS. HOLMES: Could you hold on until we get it, get a copy of it.

(Pause.)

MS. HOLMES: We don't have a complete copy with us; we only have paraphrasing. So if we could have a complete copy, that would be --

MR. ELLISON: That's fine. Let me refer you to --

MS. HOLMES: Page --

MR. ELLISON: -- page 2-3 of the final staff assessment.

MS. HOLMES: Right.

MR. ELLISON: There's a discussion of it at the bottom of page 2-3; there's a discussion on page 2-27, --

MS. HOLMES: And 2-30.

MR. ELLISON: -- and 2-30, and I believe 2-31.

MS. HOLMES: Do you have a copy of the FSA with you?

(Pause.)

MS. HOLMES: These weren't contained in Mr. Thomas' testimony, right? You're asking him about something that's in staff's testimony?

MR. ELLISON: I'm asking about a code section that is within the jurisdiction of his agency that is described in the staff's FSA, that's correct.

MR. THOMAS: I'm looking at page 2-30 of the final staff assessment, 2-30.

MR. ELLISON: Are you looking at the third bullet on the page there?

MR. THOMAS: Yes.

MR. ELLISON: Okay, the one that says, compliance with the Porter-Cologne Act, section 13142.5(b) which requires in a power plant the best design, technology and mitigation feasible to minimize intake mortality of all forms of marine life, correct?

MR. THOMAS: Yes.

MR. ELLISON: And if you look across at 2-31, do you see in the middle of the second full paragraph another discussion of that same code section where it says, of particular interest in this case is section 13142.5(b), which establishes an explicit state policy for power plants proposing to use sea water, et cetera?

MR. THOMAS: Yes.

MR. ELLISON: And then if you look back at page 2-3 --

MR. THOMAS: Since we're just doing the same thing over and over again, we can just stipulate it's in there.

(Laughter.)

MR. ELLISON: Well, I actually do want you to look at 2-3, because it has a different description of it, which I think is actually the most relevant.

MR. THOMAS: Okay. What part of 2-3?

MR. ELLISON: The very bottom of the page.

MR. THOMAS: Okay, yes, I see it.

MR. ELLISON: You see where it says of particular interest in this case, and it cites the code section again. And there it says, which establishes an explicit state policy that new or expanded power plants proposing to use, et cetera. You see that?

MR. THOMAS: Yes.

MR. ELLISON: Now, this is a code section that is normally within the jurisdiction of your agency, correct?

MR. THOMAS: Yes.

MR. ELLISON: Is it not true that this power plant, the Morro Bay Power Plant, has been determined to be an existing facility for the purposes of this section?

MR. THOMAS: No.

MR. ELLISON: This facility is not a new or expanded power plant within the meaning of this section, correct?

MR. THOMAS: I don't know.

MR. ELLISON: Do you recall the meeting of the Regional Board that occurred on the 30th of May --

MR. THOMAS: Yes.

MR. ELLISON: And do you recall when Mr. Anderson gave his presentation?

MR. THOMAS: Yes.

MR. ELLISON: And do you recall Jennifer

Saloway interrupting that presentation?

MR. THOMAS: Yes.

MR. ELLISON: To address this issue?

MR. THOMAS: Yes.

MR. ELLISON: With that refreshment of your recollection, wasn't it her position that this section does not apply?

MR. THOMAS: I'm not going to speculate on her opinion of this section. She'd have to answer that, herself.

MR. ELLISON: Well, let me ask this. You have reviewed this project as an existing facility, correct? Has that not been a determination of your agency?

MR. THOMAS: It is an existing facility with respect to the state's thermal plan. In other words, it's an existing discharge with respect to the state's thermal plan.

It is a new facility with respect to the Clean Water Act, as far as being a new source. And that's why we are relying on the Energy Commission's CEQA analysis.

MR. ELLISON: Okay, in the interest of time, can I ask that the Regional Board submit to the record from legal counsel its position on whether this code section is properly applied --

MR. THOMAS: Yes.

MR. ELLISON: -- to this project?

MR. THOMAS: It's --

MR. ELLISON: Do you have any objection to doing that?

MR. THOMAS: No.

MR. ELLISON: Okay. And as long as we're on this very similar topic, let me turn to Mr. Anderson very briefly.

Actually, let me ask this. Mr. Anderson, do you recall the discussion that I referred to a moment ago when Ms. Saloway confronted the Regional Board?

MR. ANDERSON: Yes, I do.

MR. ELLISON: Do you recall it the way that I just --

MS. HOLMES: I'm going to object to this. You've asked for a formal letter with a written response. And I think it's appropriate simply to wait for that, rather than --

MR. ELLISON: Fair enough. Go ahead.

MR. ANDERSON: Best evidence, I think, we'd better rely on --

MR. ELLISON: I agree with that, that's

fair.

Now, if you'd turn to page 2-30, or page 2-3, there are also some references in your testimony, Mr. Anderson, to Warren Alquist Act section 25527, which, as you did in terrestrial, you describe here as saying, which says not to permit power plants in estuaries and natural reserves.

Do you recall the discussion that we had about this during terrestrial, correct?

MR. ANDERSON: Yes, I do.

MR. ELLISON: Isn't it fair to say that this is not an accurate verbatim description of what that code section says?

MR. ANDERSON: Let us get it. I'll read it to you.

MR. ELLISON: Okay.

MR. ANDERSON: What I've got, I paraphrased a little bit, I didn't include all the examples because they weren't relevant.

The following areas of the state shall not be approved as a site for a facility unless the Commission finds that such use is not inconsistent with the primary uses of such lands, and that there will be no substantial adverse environmental impacts, and the approval of any public agency having ownership or control of such lands is obtained.

And they are, state, regional, county and city parks; wilderness; scenic or natural reserves; areas for wildlife protection; recreation; historic preservation; natural preservation; areas in existence of the effective date of this division. B) estuaries in an essentially natural and undeveloped state.

In considering applications for certification, the Commission shall give the greatest consideration to the need for protecting areas of critical environmental concern, including but not limited to, unique and irreplaceable scientific, scenic and educational wildlife habitats; unique historical archeological and cultural sites; lands of hazardous concern; and areas under consideration by the state or the United States for wilderness or wildlife and game reserves.

Is that enough?

MR. ELLISON: Is that all of it?

MR. ANDERSON: That's it.

MR. ELLISON: Okay. You did not include

"a natural or undeveloped state" as a modifier of estuaries in your description, correct?

MR. ANDERSON: No, I didn't.

MR. ELLISON: And you state here that this section says not to permit, when in fact the section says not to permit unless certain findings are made, correct?

MR. ANDERSON: That's correct.

MR. ELLISON: Okay, Mr. Anderson -- and if these questions belong somewhere else, you can refer them, but can you turn to 2-39.

MR. ANDERSON: Yes.

MR. ELLISON: Under other potential mitigation strategies, do you see the line that says, due to the significant resources involved, staff recommends that any increase in water use due to the project be treated as significant adverse impact and therefore recommends that the Energy Commission prohibit any such increase.

Do you see that?

MR. ANDERSON: Yes.

MR. ELLISON: You're referring there to an increase as a result of modernization, in other words, an increase of the new plant in comparison to the existing plant, correct?

MR. ANDERSON: Yes.

MR. ELLISON: Now, with respect to the capacity of the pumps, is it not the case that modernization will reduce their maximum capacity from 668 million gallons a day to 475?

MR. ANDERSON: That's true.

MR. ELLISON: And with respect to long-term operation, is it not true that Duke has proposed a cap of 370 million gallons a day as an annual daily average?

MR. ANDERSON: Yes, they have, as an annual average.

MR. ELLISON: If I were to ask you to refer to table 8, -- 2-25, there you present several proposed baselines for the average annual historic use of the existing plant, correct?

MR. ANDERSON: Yes, I do.

MR. ELLISON: Are any of them below 370 million gallons per day?

MR. ANDERSON: Well, I lumped these in averages of five years, 10 years and 14 or 15 years, as possible. The answer to your question, I could look at individual years, in which case from the year 1997 to 2001, two of those years would use less water than 370. Three of those years during that five-year period use less water than the 475.

So, I've lumped them for convenience into five-year averages, but if we look at individual years, that's a different story. And if we look at individual months, it's quite a different story.

In fact, out of the 15 years worth of historic water information we have, which is 180 months, 125 of those months used less water than 475 million gallons per day, of which your proposed project could use any day for undetermined periods of time, weekly or monthly; 69 months out of 180 months used less than 370 million gallons per day.

So depending on how you look at the figures of the current plant versus historic water use, I'd say that the current plant is absolutely going to use more water during some periods of time.

MR. ELLISON: The question that I posed to you was isn't 370 less than any of the figures that you've given under the column average annual historic use on this page?

MR. ANDERSON: Yes.

MR. ELLISON: Do you think it's appropriate to compare, if you're going to compare the new plant to the existing plant, do you not think it's fair to use the same time periods for comparison?

MR. ANDERSON: I'm not sure what you mean.

MR. ELLISON: I mean if you're going to compare the effect of the existing, of the new plant over the period of a day, is it not fair to compare it to how the existing plant might operate over a period of a day, or for --

MR. ANDERSON: I --

MR. ELLISON: -- example, let me finish, or for example, if you want to compare it to a period of a week to compare it to a week, or a year to a year? Don't you think that's fair?

MR. ANDERSON: That is fair. But it depends upon which days you're comparing to. Each day, you know, for the same day this year to last year, four years ago, there would be very different things going on in terms of how the power plant's operated then and today.

It could be less or it could be more than historic use. It's very difficult to use historic information and a predicted future information to determine if something's going to be less or greater.

MR. ELLISON: Would you agree it's fair to use the same time period?

MR. ANDERSON: Yes.

MR. ELLISON: It would not be fair to compare, for example, how the new plant might operate for a day a week to how the existing plant would operate for five years or ten years, correct?

MR. ANDERSON: No. I don't know how the new plant is going to operate.

MR. ELLISON: Well, you know what its maximum capacity is, correct?

MR. ANDERSON: Four-seventy-five, which is quite a bit greater than a lot of the historic use.

MR. ELLISON: And you know what the annual daily average cap would be, correct?

MR. ANDERSON: I know what you're proposing.

MR. ELLISON: Okay. Does staff have any reason to oppose the 370 annual daily average cap?

MR. ANDERSON: Staff doesn't oppose it.

Staff maintains, as we did in our rebuttal that the number to use for impact analysis is what could maximally be drawn through with the pumps, which is 475 million gallons per day.

That could happen over 200 days a year; it could happen on those maximum spawning events we talked about; it could happen a lot of times. It's very difficult to predict any difference between more and less over time. Because it's subject to a lot of uncertainty.

MR. ELLISON: Can the same not be said for the existing plant?

MR. ANDERSON: Yes.

MR. ELLISON: And the existing plant could run at 668 million gallons per day over a day or a week or a season, correct?

MR. ANDERSON: Well, it could, but it hasn't. I'd say on a daily basis, it has. And there are some high months, but the overwhelming number of months, 125 out of 180 have been less than 475; 69 have been less than 370.

MR. ELLISON: The Committee in this case directed staff to prepare a baseline against the most recent five years, correct?

MR. ANDERSON: Yes.

MR. ELLISON: And what would be the number associated with that baseline?

MR. ANDERSON: Well, if we use the five-year average it's one number. But if we look at those five years, in both the case where we used 2001, or if we used numbers from when Duke first filed the AFC, which is 2000, we find that when we use the year -- if we use the year '96 through 2000, three of those years use less water than your annual cap.

So, to me, that means that there's very high potential for the power plant, even if it is capped at 370, to use more water than it has historically, at least on a year-to-year basis.

MR. ELLISON: Mr. Anderson, that was not my question. I'm going to has to ask that the Committee direct you to answer the question I asked.

The question I asked was if you use the most recent five years, what is the average annual water use of the existing plant?

MR. ANDERSON: I didn't think that was your question. I thought you just said use the last five years.

HEARING OFFICER FAY: Do you have the

question in mind, Mr. Anderson. Do you have the question in mind?

MR. ANDERSON: Well, the answer is in table 8. If you're looking at the last five years, which is 436.6 million gallons per day. Is that what you meant, Mr. Fay?

HEARING OFFICER FAY: I believe that's the question counsel asked.

MR. ELLISON: Now, further down on page 225, you suggest using a different baseline than the one the Committee suggested, correct?

You see the discussion that says staff believes that a ten-year average, et cetera, is the most appropriate to use?

MR. ANDERSON: Yes.

MR. ELLISON: And then you see the discussion of the year 2000 being, by all accounts, a very unusual year?

MR. ANDERSON: Yes.

MR. ELLISON: Did you examine any other years in the last ten years to see whether they were unusual?

MR. ANDERSON: I looked at them and noticed there were a lot of differences.

MR. ELLISON: Did you look, over the

last ten years, to see, for example, whether there were any years in which the plant had been down for unusual outages or maintenance breakdowns?

MR. ANDERSON: No.

MR. ELLISON: Did you do any investigation of the effect of the change in restructuring of the California electric market and whether that might change the way the plant had operated?

MR. ANDERSON: I only looked at water use.

MR. ELLISON: Did you look at the effect on water use of these things is what I'm referring to. So let me restate the question.

Did you look at whether either the change in ownership, PG&E to Duke, or the change in the restructuring of the California electric market would have a change in water use for this plant?

MS. HOLMES: Can I just ask a question of clarification. Are you asking him whether or not he correlated certain other external events in time to water use in time? Is that your question?

MR. ELLISON: No. The question is whether he did an investigation of any kind, any kind of analysis to see whether those events that I described might be significant for determining the behavior, the water consumption of the existing plant?

HEARING OFFICER FAY: I'm sorry, it does sound like what Ms. Holmes asked; that is, you're asking Mr Anderson if he linked those events to the water use.

MR. ELLISON: Well, what I meant to ask him is a fair question, so let's ask that one.

HEARING OFFICER FAY: Did you do that?

MR. ANDERSON: No, I didn't.

MR. ELLISON: Okay. Isn't it true that the years post the sale to Duke and post deregulation, if you will, have been higher than the previous years in the 1990s?

MS. HOLMES: Are you talking about water use, again?

MR. ELLISON: Water use, yes.

MR. ANDERSON: I don't know what years you're talking about. If you'd tell me, I'll answer. When did Duke buy the plant?

MR. ELLISON: I believe it was 1998, is that correct? 1998.

MR. ANDERSON: 1998, the annual use was

349 million gallons per day. '99 it was 468. The year 2000 it was 567. And the year 2001 it was 518.

The first three years are less than 475. The last two are greater.

MR. ELLISON: Mr. Cochran has testified in this proceeding as to PG&E's operation of the Morro Bay Power Plant prior to its sale. Have you seen that testimony?

MR. ANDERSON: No, I haven't.

MR. ELLISON: Let me just say that he testifies that PG&E operated Morro Bay for a variety of reasons, including compliance with transmission arrangements that it has on path 15.

Did you look at any of those sorts of issues?

MR. ANDERSON: No, I didn't.

MR. ELLISON: Okay. If you use the Committee's directed baseline and Duke's annual daily average of 370 million gallons per day, would you agree that the water use is going down?

MR. ANDERSON: The Committee directed us to use five years; they didn't say a five-year average. Each one of those years has different uses, some of which are lower than what you're proposing.

So, it's not clear to me exactly how I should, you know, -- I can give you an answer on the five-year average, but it will be different than I give you an answer for five years.

MR. ELLISON: Let's take the average of the five years.

MR. ANDERSON: Okay. I actually did kind of forget what the question was after I responded.

MR. ELLISON: Well, you've testified that the Committee's -- using the average, the Committee's five-year average is the 436.6 mgd number, correct?

MR. ANDERSON: Yes.

MR. ELLISON: And obviously that's higher than the 370 mgd number, correct?

MR. ANDERSON: Yes, it is.

MR. ELLISON: And on a capacity basis, the capacity of the existing project is 668 mgd, correct?

MR. ANDERSON: That's correct.

MR. ELLISON: And the capacity of the new project would be 475, correct?

MR. ANDERSON: Yes.

MR. ELLISON: Okay.

PRESIDING MEMBER KEESE: Mr. Ellison, you have made your point. It would be a little hard if one had an annual average of 370 to have a five-year average over 370. If that's your point, I think, at least the way I remember arithmetic.

(Laughter.)

MR. ELLISON: With respect to the year 2000 being an aberration, do you know what the capacity factor for the plant was in the year 2000?

MR. ANDERSON: No, I don't.

MR. ELLISON: Do you recall there was testimony earlier in this proceeding, I believe it was in the neighborhood of 60 percent, do you recall that?

MR. ANDERSON: Today?

MR. ELLISON: No, it was earlier in the proceeding.

MR. ANDERSON: I probably didn't attend. I do know what the water use was.

MR. ELLISON: Are you familiar with the staff's alternatives testimony?

MR. ANDERSON: Somewhat.

MR. ELLISON: And in the no-project

alternative the staff forecasted the future operation of the existing project, are you familiar with that?

MS. HOLMES: If you aren't, that's fine to say no.

MR. ANDERSON: Well, no, I'm not. I'd have to look at it. But maybe I can answer your question.

MR. ELLISON: Okay. Well, if you accept that in the no-project alternative, the staff forecasts that the existing project will run, units 1 through 4 together, will run at a 59 percent capacity factor for, I believe, through 2005 or '6, I'd have to look it up, but for several years into the future.

Would that change your opinion about the year 2000 being an aberration?

MS. HOLMES: I think I'm going to have to object to the question, because my recollection of Ms. Lee's testimony on no-project alternative was that it was not a precise forecast of exactly how the plant was going to operate. It was a general statement meant to bound the parameters of the no-project alternative. We had some discussion about that.

HEARING OFFICER FAY: Okay, the --

MS. HOLMES: Was that just yesterday?

HEARING OFFICER FAY: -- FSA either says it or it doesn't. Mr. Ellison, can you cite us to the portion of the FSA that --

MS. HOLMES: It's on page 4-11. But I'm referring to the discussion that we had when the alternatives section was being discussed, in which the staff witness explained how she derived and how she used those numbers. Which, unfortunately, we don't have before us here.

HEARING OFFICER FAY: She's not present?

MS. HOLMES: Right.

HEARING OFFICER FAY: Mr. Anderson, do you recall the numbers she relied on?

MR. ANDERSON: No, I don't. I don't know.

HEARING OFFICER FAY: All right, let's --

MR. ELLISON: That's fine, we have --

HEARING OFFICER FAY: -- move on. Well, on page 4-11, at the bottom of the first full paragraph under defining the no-project scenario, is that what you're referring to, where staff says the no-project alternatives seem to be as follows:

2002 to '6, units 1 through 4 operational --

MS. HOLMES: Right.

HEARING OFFICER FAY: -- 59 percent.

MS. HOLMES: That's the testimony. My point was merely that this was -- that there was some more detail brought out at the alternatives portion of the hearings on Tuesday about how she derived those numbers and used them for purposes of the analysis.

I think perhaps it would just simply be more important to ask Mr. Anderson whether he considered this in his testimony.

MR. ELLISON: That was my question.

(Laughter.)

MS. HOLMES: I'm glad I could ask it for you.

MR. ELLISON: I simply wanted to know if staff, in the alternatives discussion, is forecasting that the existing plant will run, as it did in the year 2000, for the years 2002 through 2006, and --

MS. HOLMES: But I think that there's a point of the clarification that we made at the hearing was it was not a precise forecast. It was something that was used to bound the -- but it's certainly acceptable to ask Mr. Anderson whether or not he was aware of those numbers when he wrote his water testimony.

MR. ELLISON: Were you?

MR. ANDERSON: No.

MR. ELLISON: Now that you are aware of them, does that change your opinion about the year 2000 being an aberration?

MR. ANDERSON: Well, it looks to me that the year 2000, in terms of water use, if you can compare that at all to capacity, is probably about 80 percent. It's 567 out of 668, I guess, was your capacity.

That would be greater than 80 percent. So, no --

MR. ELLISON: This is really a yes or no question.

MR. ANDERSON: Then I guess it's no.

MR. ELLISON: Okay, thank you. I'd ask you to return to 2-28.

MR. ANDERSON: Yes.

MR. ELLISON: Actually let's go first to 2-29, do you see the discussion of cumulative impacts there?

MR. ANDERSON: Yes, I do.

MR. ELLISON: And there's a definition in CEQA 15355 that a cumulative impact is one which results from the combination of impacts associated with the proposed Morro Bay Power Plant, in addition to those resulting from separate projects in the region, do you see that?

MR. ANDERSON: Yes.

MR. ELLISON: Am I correct that that is your understanding of how cumulative impacts are done under CEQA?

MR. ANDERSON: I think that sounds right.

MR. ELLISON: Okay. So, the point being that what you're doing is you're taking this project and accumulating its impacts with other projects, as projects is defined in CEQA, correct?

MR. ANDERSON: That's what that statement would indicate.

MR. ELLISON: Well, that's your statement, you wrote that, right?

MR. ANDERSON: Yeah.

MR. ELLISON: Okay. So can I presume you agree with it?

MR. ANDERSON: Well, I do. But there's a little more to it than that.

MR. ELLISON: Well, what more is there to it?

MR. ANDERSON: Well, from separate projects in the region, and I'm thinking about projects in general, residential, urban, other things that are occurring that contribute to degradation of the bay as all being cumulative impacts on the bay. The power plant contributes, too.

MR. ELLISON: So is it correct then that for the purposes of this discussion you're saying that you didn't identify any specific projects, correct?

MR. ANDERSON: That's correct.

MR. ELLISON: And that you included as projects anything that might affect the bay?

MR. ANDERSON: Well, I would say that things that are occurring currently.

MR. ELLISON: So, for example, sedimentation?

MR. ANDERSON: Yes.

MR. ELLISON: Is it your understanding that sedimentation is a project under CEQA?

MR. ANDERSON: Well, the things that cause it often could be. But, no.

MR. ELLISON: Let me ask this. If we turn to page 2-28, just under indirect and cumulative ecosystem impacts, do you see that?

MR. ANDERSON: Yes.

MR. ELLISON: And there it appears to me that you are accumulating entrainment impacts and impingement impacts, do you see that?

MR. ANDERSON: Yes.

MR. ELLISON: And those are the entrainment impacts and impingement effects of this project, correct?

MR. ANDERSON: Yes, they are.

MR. ELLISON: Is it your understanding under CEQA that the entrainment impacts of this project and the impingement impacts of this project are separate projects for cumulative impacts purposes?

MR. ANDERSON: They're not separate projects.

MR. ELLISON: Well, in that case, since cumulative impacts is the accumulation of separate projects, it's not appropriate to accumulate entrainment and impingement, is it?

MR. ANDERSON: I don't know, I mean it's difficult. They're separate impacts. Somehow we need to account for all three of them.

MR. ELLISON: We do account for all three of them by looking at them, correct?

MR. ANDERSON: Yes.

MR. ELLISON: And we did look at them, correct?

MR. ANDERSON: Yes.

MR. ELLISON: And the technical working group and Regional Board Staff, at least, found even with an absolute baseline that impingement was not significant, correct?

MR. ANDERSON: Yes.

MR. ELLISON: And they also found the same for thermal, correct?

MR. ANDERSON: Yes.

MR. ELLISON: So is it your view that you can take an impact, entrainment, which you think is significant, and add to it insignificant impacts for a cumulative impact?

MS. HOLMES: You're assuming that he's concluded -- I'm sorry, can you restate the question?

MR. ELLISON: The question was whether you can take a significant impact of this project and add to it impacts that are individually not significant for the purposes of cumulative impacts analysis?

MS. HOLMES: Are you still referring to his testimony on indirect impacts?

MR. ELLISON: I'm referring to his testimony on indirect and cumulative ecosystem impacts on 2-28, and his discussion that staff believes this degradation is a significant cumulative impact, as well as his discussion of entrainment and impingement effects being, as I read the testimony, cumulative.

MR. ANDERSON: Well, I've considered that I have stated that impingement impacts were not biologically significant under CEQA, as were thermal impacts.

But entrainment was. And if we look at the whole project, in a cumulative sense with other things, then I include impingement and entrainment as part of the overall cumulative impact.

MR. ELLISON: Would you agree that these are not separate projects?

MR. ANDERSON: They're not separate projects.

MR. ELLISON: Will the Morro Bay Power

Plant cause sedimentation in the estuary?

MR. ANDERSON: No.

MR. ELLISON: And does the Morro Bay Power Plant cause any point source pollution in the estuary?

MR. ANDERSON: Probably in minor amounts; there's stormwater runoff that enters the estuary from the plant site. But I don't expect it to be too dirty.

MR. ELLISON: It wouldn't be significant, would it?

MR. ANDERSON: No.

MR. ELLISON: Okay. This may be a question for Mr. Anderson, Dr. Raimondi, whoever.

Let me tell you what it has to do with. It has to do with the effects of assuming proportional mortality of 33 percent, together with certain other assumptions, a hypothetical. So I think it's probably Dr. Raimondi. If it's not, you can redirect it.

I'm going to pose a hypothetical to you and ask you if you have it in mind, and then we'll get into the consequences.

The hypothetical is that you have a 33 percent proportional mortality impact on larvae.

That you assume that you therefore have a 33 percent impact on adult populations. And this is per year.

And that there is no compensatory effect such that every year the plant is reducing the adult population of the taxa in question by a third.

Is it not true that if that were -- under that hypothetical, that in a relatively short time, if you started with let's say a million fish, that you would be down to zero within the lifetime of, let's say this, within the lifetime of the -- the 50-year lifetime of the existing project? Would you not be down to zero, reducing by a third every year, starting with a million?

DR. RAIMONDI: I can't remember what yes and no means here, so --

(Laughter.)

DR. RAIMONDI: I think what you're asking is the following. That if we make the assumption that there's 33 percent loss due to entrainment proportional mortality, would that correspond annually, regularly, to a 33 percent decline in fish populations within Morro Bay.

And if that were the case, it's sort of a contingent question, would that necessarily cause the population to spiral down inexorably toward local extinction.

The answer is yes.

MR. ELLISON: Okay, and wouldn't that happen fairly rapidly?

DR. RAIMONDI: Under the scenario that you made up, yes.

MR. ELLISON: Yes. Okay, I'm sorry to jump around here. This is a question for Mr. Anderson. Let me refer you to the bottom of page 9.

MR. ANDERSON: Yes.

MR. ELLISON: Under entrainment fatality you state there that staff has seen no credible documents, nor has applicant provided any that indicates that the species that will be entrained if the proposed new facility is built and operated will experience fatality rates of less than 100 percent. Do you see that?

MR. ANDERSON: Yes.

MR. ELLISON: Now, Duke testimony includes a number of references to such studies. Have you not reviewed those studies?

MR. ANDERSON: Well, I hadn't reviewed them when -- actually, I haven't still reviewed them. But I didn't review them when I put the rebuttal together.

MR. ELLISON: Okay, so the answer is no, you have not reviewed those --

MR. ANDERSON: The answer is no.

MR. ELLISON: And for Dr. Raimondi, on the same issue of 100 percent mortality, you did, in your opening presentation, discuss how if that the studies which have shown survival rates, in your opinion that there has been, I believe you said massive mortality of the larvae after they have returned to the environment, something to that effect, do you recall that?

DR. RAIMONDI: Yes.

MR. ELLISON: Is not massive mortality of larvae in the natural environment normal?

DR. RAIMONDI: Yeah, but I -- and perhaps this was a problem that comes from trying to span the academic realm to this, but when I said massive mortality, of course I was using that with reference to a control situation, which would be individual that had not been subjected to the same treatment in this case.

And so what I meant by that is more specifically that the mortality rates would be larger than expected, which are large, but a natural mortality.

And this was largely based upon work that was done down at San Onofre.

MR. ELLISON: So you're saying then larger than expected from normal, as opposed to --

DR. RAIMONDI: Let me give you an example that may clarify things. And these numbers are just examples, they are not -- I don't remember what the numbers are.

But let's say that the actual mortality rates that are on the order of 75 percent per day, which are -- or 50 percent per day, which are out of the 316B for some of the species, about 50 percent per day, is within realm. That's normal mortality rates.

If you impose an additional mortality rate upon it, which was another 25 percent, another 50 percent, that's what I would consider to be on top of the natural mortality rates.

Again, that's hypothetical. I don't really know what the numbers are.

MR. ELLISON: So would it be fair to say

then that what you're saying is that you believe that some of the studies indicate that there has been an increase above normal in mortality from these surviving larvae?

DR. RAIMONDI: Yes.

MR. ELLISON: Okay. Dr. Raimondi, do you believe that the species that are entrained by the plant are currently limited by larval production?

DR. RAIMONDI: I don't think I or anyone else has any way to answer that question. I don't know.

MR. ELLISON: Do any of the entrained species, in your opinion, have commercial significance?

DR. RAIMONDI: Yeah, um-hum, some of them do. Do you want me to follow up on that? I mean there are a number of species that do have commercial significance.

MR. ELLISON: Are any of the species that were significantly entrained the ones that you were concentrating on have commercial significance? The gobies, --

DR. RAIMONDI: You mean the ones that we're taking in the majority?

MR. ELLISON: Yes.

DR. RAIMONDI: Or that had the highest ETM values?

MR. ELLISON: Yes.

DR. RAIMONDI: Let me just take a look at the values here. I guess the issue, and maybe you can help me with this, is what counts as significant. I think they're all significant.

So, under that, yes. I mean there's rock fish, there's croaker, those are both commercially important species. There's herring. And those are just the fish.

There's also crabs. And there's a lot of invertebrates that weren't sampled, and we have no idea what was taken there.

MR. ELLISON: Let me ask you this, you've testified that the species that were used to calculate the proportional mortality were proxies for all the species that are entrained, correct?

DR. RAIMONDI: That was the intent.

MR. ELLISON: And that intent was carried out, was it not?

DR. RAIMONDI: In my opinion, yes.

MR. ELLISON: Okay. Is it not also true

that there are a number of species that are not entrained by the plant?

DR. RAIMONDI: There's two parts to that question. There is a number of species that have life histories which would cause them not to be entrained by the plant, because they don't have larval forms, absolutely.

I don't know, I mean we'd have to look and see what -- I have never systematically looked at the list of species for which there has been entrainment compared to what the source water population shows for the same, you know, for the larval forms there.

I suspect that any species that is in the source water that has larvae has been entrained. But that's just a guess.

MR. ELLISON: Okay. Let me pause for a moment and ask Mr. Fay how we're doing on time. Do you know how much time we have left? I say that because my stopwatch stopped.

HEARING OFFICER FAY: You've got about 40 minutes left.

MS. HOLMES: Is that total?

HEARING OFFICER FAY: Yes.

MS. HOLMES: Just curious.

HEARING OFFICER FAY: Yeah.

MR. ELLISON: I couldn't hear the --

HEARING OFFICER FAY: About 40 minutes left.

MR. ELLISON: Okay.

PRESIDING MEMBER KEESE: Unless you're looking for a gold star.

MR. ELLISON: I'm sorry?

(Laughter.)

PRESIDING MEMBER KEESE: Unless you're looking for a gold star.

MR. ELLISON: Okay, I understand. I may have a few more questions, I may not. Can we take a few-minute break? Is this an appropriate time?

HEARING OFFICER FAY: Sure. Yeah, let's take a ten-minute break, and actually be back in our seats in ten minutes, please.

(Brief recess.)

MR. ELLISON: Okay, just a few more questions; they should go fairly quickly, I hope. Is everybody ready? Is the staff panel ready?

(Pause.)

HEARING OFFICER FAY: What witness do you need, Mr. Ellison?

MR. ELLISON: I'm just looking for

Michael Thomas, because I do have one question for him.

HEARING OFFICER FAY: Michael Thomas, please, front and center.

MR. ELLISON: Doesn't have to be now.

HEARING OFFICER FAY: Right here, this way.

BY MR. ELLISON:

Q Let me start out with Mr. Anderson. Mr. Anderson, for purposes of your assessment of larval mortality, you relied upon the technical working group and the Regional Board analysis, correct?

MR. ANDERSON: Yes.

MR. ELLISON: You didn't do an independent analysis other than that, correct?

MR. ANDERSON: No, I didn't.

MR. ELLISON: And this is for the entire panel. If anybody has a different answer than any other member of the panel, let me know.

Do you all agree that Duke performed the 316B studies in accordance with the directions of the technical working group?

MR. ANDERSON: Yes, for the most part. In the executive summary there is an averaging of the results that results in 10 percent proportional mortality. And that was not done under the direction of the technical worker -- or agreed to by the technical worker.

MR. ELLISON: Okay, but --

HEARING OFFICER FAY: Excuse me, that's the executive summary of what document?

MR. ANDERSON: 316B report.

HEARING OFFICER FAY: Okay.

MR. ELLISON: Apart from that, is the 316B study in accordance with the directions of the technical working group?

MR. ANDERSON: Yes.

MR. ELLISON: Okay. And for you, Mr. Thomas, in your staff report you have certain statements about the feasibility of closed-cycle cooling. Do you recall those?

MR. THOMAS: Yes.

MR. ELLISON: In making those conclusions or those statements, were you relying upon the Energy Commission Staff's analysis in the final staff assessment?

MR. THOMAS: Yes.

MR. ELLISON: Were you relying upon anything else, or any independent study that you did? Did you rely on anything other than the FSA for your conclusions about feasibility of closed-cycle cooling?

MR. THOMAS: I understand the question.

MR. ELLISON: Okay.

MR. THOMAS: The TetraTech report that was submitted to us in several versions, which I think you have copies of, we used that. But that report was not a site specific analysis. The Energy Commission Staff's report was a site specific analysis, so we relied on those two reports.

MR. ELLISON: So, if the purpose was the feasibility of closed-cycle cooling at this site, you were relying exclusively upon the staff's final staff assessment, is that fair?

MR. THOMAS: Yes.

MR. ELLISON: And then lastly for Mr. Anderson, if I could ask you to turn to 2-24.

MR. ANDERSON: Yes.

MR. ELLISON: Second paragraph discusses some of the reasons that the staff believes that the 475 mgd figure is the appropriate figure for comparison to the baseline, correct?

MR. ANDERSON: Yes.

MR. ELLISON: First of all, let me say this, the 475 mgd figure assumes duct firing, correct?

MR. ANDERSON: It assumes that eight pumps are running.

MR. ELLISON: And you would not run eight pumps unless you were duct firing, correct?

MR. ANDERSON: Well, --

MS. HOLMES: I think that that's been covered by other people testifying. You can ask him whether or not he knows that.

MR. ELLISON: Do you know that?

MR. ANDERSON: I would assume you wouldn't.

MR. ELLISON: Okay. So when you refer to the applicant would be able to operate up to the maximum 475 mgd level for an unknown number of days, weeks or months, you are testifying that the applicant would operate in duct firing mode 24 hours a day for days, weeks or months, correct?

MR. ANDERSON: Yes.

MR. ELLISON: Okay. Now, do you know of any power plants, combined cycle power plants with duct firing that have operated in duct firing mode for months? Twenty-four hours a day, duct firing all the time for months?

MR. ANDERSON: I have very little knowledge of how often power plants are operating. So the answer is no.

MR. ELLISON: That's all I have, thank you.

HEARING OFFICER FAY: Okay. CAPE.

CROSS-EXAMINATION

BY MR. NAFICY:

Q Okay, I'll start with Mr. Thomas. Mr. Thomas, you were asked questions about the statement that the thermal effect is reasonable. Do you remember that?

MR. THOMAS: Yes.

MR. NAFICY: And I believe you agreed with Mr. Ellison when he suggested that your conclusion was based on, I believe you said, in an absolute sense, is that correct?

MR. THOMAS: Yes.

MR. NAFICY: What did you understand that question to mean?

MR. THOMAS: It's not compared to some type of baseline, or compared to existing versus future conditions.

MR. NAFICY: Is it correct, though, that

your conclusion that the thermal effects is quote reasonable is based on a comparison between the cost of moving the outfall further out?

MR. THOMAS: Yes.

MR. NAFICY: Would you agree that the thermal effect is adverse?

MR. THOMAS: The word adverse has meaning, has legal meaning in the 316B regulation. It does not have meaning under the thermal plan. Under the thermal plan, the language is reasonable protection of beneficial uses.

MR. NAFICY: I was actually looking for adverse impact in the CEQA sense. Is it an adverse impact, I haven't asked if it's significant or not, but is it an adverse impact?

MR. THOMAS: In a CEQA sense --

MS. HOLMES: I'm going to object to that because the CEQA witness is Mr. Anderson. The Regional Board is specifically relying on the Energy Commission.

HEARING OFFICER FAY: I have to sustain that. Mr. Thomas is not the appropriate witness, since the Water Board doesn't apply CEQA. But you could ask Mr. Anderson.

MR. NAFICY: Well, I understand, but the

statement that the thermal effect is reasonable is attributed to Mr. Thomas. I can withdraw the --

HEARING OFFICER FAY: The point is he does not apply the CEQA standard when making that judgment.

MR. NAFICY: I was just referring to the meaning of the word, but strike the CEQA reference all together.

Is it good for the environment or bad?

MR. THOMAS: The thermal discharge has an impact on about 600 feet of the north intertidal zone along Morro Rock.

You say is that good for the environment or bad. What do you mean by environment? If you're talking about that 600 feet of the Rock, it's a negative effect or an impact on that area.

MR. NAFICY: That's all, thanks. Dr. Raimondi, you were asked about the commercial significance of the entrained species. These larvae that are entrained, do they serve as food for other species?

DR. RAIMONDI: Yes.

MR. NAFICY: Now, do some of the fish that actually prey on the larvae that's produced or hatched in the estuary, are some of those fish that feed on the larvae commercially or recreationally significant?

DR. RAIMONDI: Yes.

MR. NAFICY: Could you name a few, if you can recall, of commercially or recreationally significant fish that feed on the larvae from the estuary?

DR. RAIMONDI: I can give some examples.

MR. NAFICY: Please.

DR. RAIMONDI: If the larvae are exported, either to the mouth of the estuary, as they do get exported through the mouth of the estuary, then rockfish would feed on them. There's a number of species of rockfish that would feed on them. Kelp gulpers, lots of them would feed on them. So that's one species.

You know, they're food for a lot of things. A common source of mortality for juvenile and larval forms is predation. And you have to assume that since there are commercially taken species out there that eat those forms, that they would be part of the food web for them.

MR. NAFICY: Now, are you aware of any studies on the effect of pollution on fish larvae?

DR. RAIMONDI: Yes.

MR. NAFICY: And what is the effect of pollution on fish larvae?

DR. RAIMONDI: You can't ask that question. You could ask a question that was --

(Laughter.)

DR. RAIMONDI: I mean you could ask it, but there's not a good answer to that question. There are varying effects of pollution on fish larvae. You can't categorize it that simplistically.

There are cases where different types of toxins have been shown to be extraordinarily detrimental to fish larvae. There are also cases where putative toxins have been shown not to affect fish larvae. And it depends upon the toxin, the concentration, previous exposure, other environmental conditions. There's lots of different constraints on making a general answer.

But if you're asking the question are there examples where pollutants or putative toxins have been shown to negatively affect fish larvae, yes, lots of them.

MR. NAFICY: Are you aware of what type of pollutants exist in Morro Bay?

DR. RAIMONDI: Just generally.

MR. NAFICY: Okay, --

DR. RAIMONDI: I wouldn't be the person to ask.

MR. NAFICY: Okay. Let me ask you this, and you can answer it if you know. Based on what you do know about the toxins in Morro Bay and effect of toxins on larvae, do you believe that the pollutants in Morro Bay are causing mortality of larvae in Morro Bay?

DR. RAIMONDI: I don't know. Honestly, I don't know.

MR. NAFICY: Okay. And this is directed at Mr. Anderson. Mr. Anderson, I wanted to ask you sort of similar line of questions as I did Dr. Raimondi just now.

Are you familiar with what type of pollutants exist in Morro Bay?

MR. ANDERSON: Not really. I know that because it's an impaired water body that there are some pesticides and heavy metals, I believe. And, Michael, do you know what other sediment?

But, beyond that I'm not aware of what's going on.

MR. THOMAS: Could you ask the question again?

MR. NAFICY: Sure. Are you aware of what pollutants exist in Morro Bay?

MR. THOMAS: Well, Morro Bay is on the 303D list of impaired water bodies for siltation, pathogens and metals. So we have data that shows that the water body is impaired due to those three things.

There are others; there's bacteria, and there would be associated pollutants with stormwater runoff.

MR. NAFICY: Okay, so I want to separate the pollutants that degrade or destroy habitat as opposed to other pollutants. Siltation, I understand, primarily degrades habitat, is that correct?

MR. THOMAS: I would say they all do to some degree, but --

MR. NAFICY: Okay, well, I want to concentrate on the ones that, you know, say pathogens, that it's not just about physically removing habitat.

Are you familiar with any studies, or do you know what effect these pathogens and other pollutants have on the fish larvae in Morro Bay?

MR. THOMAS: No.

MR. NAFICY: Okay, this is going to be basically my last question to Mr Anderson. If you know, there's been a lot of talk about this Committee's order about the five-year baseline.

To your knowledge did the Committee's order also direct the staff to include any other analysis of baseline, appropriate baselines that they may deem appropriate?

MS. HOLMES: I'm not sure that's a -- I mean I can make a statement of counsel about what the Committee --

(Parties speaking simultaneously.)

MR. NAFICY: -- why don't we just --

MS. HOLMES: -- or the Committee can make a statement about what the Committee said. My recollection is that they directed us to use at least one baseline using five years of data, and offer staff; and the other part is the alternative of using a separate baseline if they choose.

HEARING OFFICER FAY: Yes, that's a fair characterization. And in deference to staff, we did leave it open that they could analyze other periods, as well, as they have done.

MR. NAFICY: Well, I appreciate the clarification, because there was a lot of discussion of that issue without that clarification.

And with that, I conclude my cross-examination.

HEARING OFFICER FAY: Okay, thank you. The City.

MR. SCHULTZ: No questions. Do I get a gold star?

HEARING OFFICER FAY: Yeah, you bet. You get Ms. Holmes' gold star.

(Laughter.)

HEARING OFFICER FAY: Okay. Then, Mr. Naficy, are you prepared to --

MS. HOLMES: I'd like to have --

HEARING OFFICER FAY: Oh, you'd like -- I'm sorry.

MS. HOLMES: Just a few questions. Half a gold star's worth.

REDIRECT EXAMINATION

BY MS. HOLMES:

Q Dr. Raimondi, there was some discussion earlier this afternoon about studies assessing the fatality rate of entrained species. Do you recollect that discussion?

DR. RAIMONDI: Yes.

MS. HOLMES: And I believe that it is correct earlier this morning you used the words massive mortality. Would it be correct to interpret that as saying that the mortality shown by those studies that you were referring to was relatively high?

DR. RAIMONDI: Yes. And I think that if you look at Dr. Cowan's report, there's a figure there. And I would just reiterate that, that there is dramatically, by species, that some species have been shown to have lesser mortality.

And that when it's been looked at typically, in my opinion, when the conditions become increasingly realistic, the mortality rates increase dramatically.

Now, there hasn't been any study that has been -- and I'm going to go back to what they said, which is that at least, in my knowledge, completely correct. I can't think of any study that has actually followed larvae around subtidally in the natural environment.

And so my conclusion was based mainly on the uncertainty that is prevalent in what happens under the stressful natural environment compared to the degrees of stress that occurs in these lab experiments, or in the tank experiments.

MS. HOLMES: Okay, thank you. And secondly there was a series of questions that you were asked by Mr. Ellison about a 33 percent fatality rate. Do you recollect that discussion?

DR. RAIMONDI: I do.

MS. HOLMES: How likely is it, in your mind, that there would be a chronic constant 33 percent effect?

DR. RAIMONDI: The question that --

MS. HOLMES: Over time.

DR. RAIMONDI: Yeah. The question that was asked to me laid out a very specific scenario which was that 33 percent of larvae were lost, that occurred every year. And that that corresponded every year to a 33 percent change, decrease in the adult population.

And under that scenario there's just no way around it. Just mathematically it has to go to zero. It has to go to zero pretty quick, in fact.

And I agree with that, as I testified. I think an important question is -- there's a series of other important questions. One is how likely is it that you're going to have that same effect every year. I think very unlikely.

I think that you have environmental conditions that change year to year, and as I've testified, as Dr. Cowan's testified, marine populations are extraordinarily variable in time and in space. And the concern that we have about such a large decrease in larval populations, from the point of view of the population, just that species population in Morro Bay is that it could lead to, and may have led to decreasing stability of the population. It becomes more susceptible to other sorts of inputs. And would continue to become more susceptible to other sorts of inputs.

Unstable populations oftentimes lead to this sort of phenomenon, which is that they're more likely to become locally extinct, blink on and blink off.

I don't want to get into theory. The whole point of this was to say that these are ecological buffers that are well known in ecological systems. They don't always operate. Many years they may not operate. But they do operate occasionally.

And it's those occasional years with respect to that particular species that we're concerned with.

MS. HOLMES: So would it be fair to say that even with no demonstrable effect on adult fish populations that wouldn't lead you to conclude that there was necessarily no impacts from entrainment?

DR. RAIMONDI: And that's a two-part question. The first is we have simply no way of knowing whether there's been an effect on the adult population. Quite honestly, we didn't study it.

Even if we had studied it for the last two years, that probably wouldn't have been enough time to come to any sort of conclusion about whether the populations are stable or unstable; whether they're in equilibrium or a -- capacity or they're not.

Typically you need more information than that. And you also need some other information. Perhaps about birth and death rates, which we also don't have. They're uncertain as to what this date of the stock is.

And, you know, I think there's no other conclusion but to make that. We don't have that information.

Apart from that, let's just take a hypothetical situation that we had that, and that the populations were more or less stable. That doesn't mean that they weren't at some higher state earlier, and they've been brought down to a lower state.

We just don't have previous information. We don't have a proper sampling design. That's just because people didn't think about it 50 years ago. And so it's not a fault of Duke, it's just that it wasn't done, and it hasn't been done.

Finally, all this presupposes the idea that the only impact that we're concerned with is the population level in Morro Bay of that particular species, or those species. I think that's a fundamental disagreement between the Regional Water Quality Board and the CEC and Duke. We think that the impacts are likely to be broader than that, and perhaps not specifically on populations, but on other things that depend upon them, on the functioning of the ecosystem or the estuary, itself.

And so that's just a difference of opinion.

MS. HOLMES: Thank you. My last

question is for Mr. Anderson. Earlier this morning there was a discussion about section 25527 of the Warren Alquist Act.

And I believe you read a portion of the section which states that in considering applications for certification, the Commission shall give the highest consideration to the need for protecting certain areas. Do you see that?

MR. ANDERSON: Yes, I do.

MS. HOLMES: Did the Commission Staff consider this an area of critical environmental concern?

MR. ANDERSON: Yes, it's both a state and a national estuary. It's very valuable. So, I agree, yes.

MS. HOLMES: Thank you very much. Those are all my redirect questions.

HEARING OFFICER FAY: Okay. Any recross, Mr. Ellison?

MR. ELLISON: I'm definitely not going to get a gold star, I know. I do have a couple questions.

RECROSS-EXAMINATION

BY MR. ELLISON:

Q First for Dr. Raimondi on this issue of

100 percent mortality. Isn't it true that at least some of the entrainment losses are the result of what we've been referring to as cropping?

DR. RAIMONDI: Perhaps if you could -- cropping is you're interpreting is lost through the plant due to a predation or something? What are you using cropping --

MR. ELLISON: Let me start at this, what's your understanding of the meaning of the word cropping?

DR. RAIMONDI: I don't have an understanding of the word cropping.

MR. ELLISON: Okay.

DR. RAIMONDI: That's been used many different ways.

MR. ELLISON: All right, then let me define it to be as you just, I believe, started to define it, loss of larvae through the cooling water system of the plant due to predation.

DR. RAIMONDI: I'm not probably the best person to ask because I don't know of any studies that have been done specifically to look at this. I know that there is, in other plants there's loss that's due not exactly to cropping, but by damage imposed. As an example, PG&E plant at Diablo Canyon, damage imposed by physical structure, barnacles in that case, at least in the old days, which would cause, because of velocity, things to be damaged on the transit through.

But I'm just not familiar enough with the literature to know the rate of cropping, as you've defined it, for Morro Bay.

MR. ELLISON: I wasn't asking you for the rate. I was just asking you, isn't that one of the ways that species can suffer mortality and have it be deemed to be entrainment.

MS. HOLMES: Are you asking whether they can or whether they do?

MR. ELLISON: I'm asking whether they can.

DR. RAIMONDI: So, the answer -- there's two parts to the answer. The first part is I would assume that this occurs. And I don't know the frequency of it.

But, having said that, those predators would not be there or in that concentration were it not for the plant.

And so it's not like just transporting these things into this predator laden area that would be there naturally. This is an unnatural system. And so those predators are in higher abundance and density and probably exert much more predation influence specifically because there is, you know, the once-through cooling system.

MR. ELLISON: So if I understand what you're testifying to is that the once-through cooling system creates an environment that attracts natural predators that feed on the larvae?

DR. RAIMONDI: It either attracts them, or it's a good environment so that they succeed and live better there.

MR. ELLISON: Okay. And to the extent these natural predators consume larvae within the cooling system, that's part of the mortality that we're calling entrainment, correct?

DR. RAIMONDI: To the extent that it occurs, you couldn't distinguish.

MR. ELLISON: Okay. I take it you haven't done any work to determine the extent to which that occurs in the Morro Bay Plant, correct?

DR. RAIMONDI: I think that's a better question for your people.

(Laughter.)

MR. ELLISON: Well, unfortunately I can't -- we actually would like to ask them that question, but I can't, so I'm going to ask you.

DR. RAIMONDI: Not under the technical working group, no.

MR. ELLISON: Okay. Based upon your overall experience and professional opinion, do you believe that some of that we'll call cropping would likely be occurring at this plant?

DR. RAIMONDI: Yes.

MR. ELLISON: And now I want to turn to this issue of the meaning of proportional mortality and 33 percent and the spiral and all of that.

I have seen some statements that have taken the technical working group's 17 to 33 percent estimates of proportional mortality and have described them as meaning that the power plant is, in various ways, paraphrased to be killing a third of the species in the bay every year.

Would you agree that that's a very misleading statement?

DR. RAIMONDI: If it's put in exactly those terms, killing a third of the species in the plant every year -- in the bay every year, I think it's misleading.

MR. ELLISON: That's all I have, thank you.

HEARING OFFICER FAY: Any recross from CAPE? City? No? Okay. Anything further, Ms. Holmes?

MS. HOLMES: We are finished, I believe.

HEARING OFFICER FAY: Okay, I just have a couple questions of Dr. Raimondi.

And I think Mr. Ellison got into most of this with his questions about cropping. But, regardless of the survival or mortality of things coming out of -- biomass coming out of the outfall, we've heard comments from the public that there's a large concentration of fish there.

So, is the release from the outfall of biomass, does that have value? If it's feeding some of these fish?

DR. RAIMONDI: This is a question that's asked almost every one of these cases, because that's a typical thing that happens is you get, you know, concentration of things at the end of the pipe, or at the end of the trench, in this case.

We don't know whether that's caused by increased biomass, you know, that's being deposited right there, or warm water. You know, there's lots of things that are going on at the end of the pipe.

And you oftentimes get extraordinarily exotic species, or at least a concentration of rare species right at the end of the pipe, sharks and rays, in particular, seem to really favor the end of pipes or warm water situations.

Whether they are there because there's an increase in the biomass, I don't know. And I wouldn't speculate at this point as to whether it's providing some functionality with respect to those individuals that are there in the warm water area. I just don't know.

HEARING OFFICER FAY: Well, we've talked about a range that indicates a pretty substantial amount of biomass being entrained, --

DR. RAIMONDI: Yeah.

HEARING OFFICER FAY: -- and it's presumably all going out in the outfall.

DR. RAIMONDI: Yes.

HEARING OFFICER FAY: So if it's not all just following as detritus on the bottom, isn't some of it, even dead or alive, being consumed by creatures most likely?

DR. RAIMONDI: I suspect that it all is.

HEARING OFFICER FAY: That it all is?

DR. RAIMONDI: In different forms. You know, there's going to be some individuals that come through more or less intact, perhaps living. They are going to function as, you know, larval organisms that are going to be eaten. Or die and end up on the bottom. There's bacteria; there's all sorts of things on the bottom that are going to digest those things.

And so in a marine system it's rare that organic matter is wasted. It's really a matter of whether it serves a function, in my opinion, of whether it serves the function that a living marine organism would have served, and whether that function is concentrated in the area in an artificial way so you get local organic enrichment, and all the things that might be associated with that versus distributed individuals that may serve a function going to other estuaries, coming back in, or growing and serving out in other parts of the marine system as food or fodder for other species that would otherwise rely upon them in that state.

HEARING OFFICER FAY: Am I correct that we shouldn't assume that whatever percentage it is is entrained is lost to the system. It's just being converted in an unnatural way. Is that fair?

DR. RAIMONDI: I think there's two issues; again, this is my opinion, but it's converted in not unnatural, but in a way that is different from the normal way.

Mostly in terms of the distribution of it, and where the function comes from it. It would be mostly concentrated near the end of the pipe or the trench in this case, rather than distributed throughout the estuary or out in the open coastal waters, which is the normal state.

HEARING OFFICER FAY: And if Duke could set up an entrainment survival study at its outfall, and determine whatever the results of the study was, but assuming that it showed less than 100 percent mortality, is there something that the technical working group, or the NEP could do with that information? Is that useful to know?

MR. THOMAS: I think that it would be useful information. I'm not sure that a study can actually be designed and carried out that would tell us what the actual mortality caused by entrainment is.

DR. RAIMONDI: But to get to the hypothetical, which would be if you could carry out a study that would actually follow individuals in the field or some way account for that, I think it would be very valuable.

HEARING OFFICER FAY: Well, yeah, and I wasn't really going that far. It sounded like that's not feasible, but if through sampling they could determine a percentage of survivability that was specific to this project, would that be considered useful to the scientific community trying to help the Morro Bay Estuary?

DR. RAIMONDI: Then you need to sort of clarify things, so I'm trying to get the details, so if, as an example, they took fish larvae that came out of the end of the trench, brought them into a tank or something and followed them and the conditions that Dr. Cowan was talking about?

I think it would be interesting. I'm not sure that it would be valuable because you still have to make that leap of faith. And you may decide to make that leap. We chose not to.

That those conditions are similar enough to the natural environment that you can say, well, because we have survivorship in tanks on the site, that there's going to be survivorship in the field.

That's the big leap of faith that has to be made.

HEARING OFFICER FAY: Okay.

MR. THOMAS: And that's why, in my opinion, that's why these studies have not been done at several power plants, where 100 percent mortality is assumed. Because of that difficulty making that leap of faith between the results of these types of studies, which we don't consider to be an accurate representation of survival or entrainment mortality.

So we can't make that leap of faith. So we just assume 100 percent mortality.

HEARING OFFICER FAY: I understand. Thank you.

All right, we want to thank the staff panel for their testimony. And ask CAPE if they're prepared to go forward with their witnesses.

MR. NAFICY: Yes, we are. We have

Dr. Stephens, Dr. Henderson and then Dr. Wagner and Tom Laurie here. If you don't mind, we'll just leave them sitting there. We'll start here, and then go down the line.

HEARING OFFICER FAY: Okay, if they'd all stand to be sworn at this time.

Whereupon,

JOHN STEPHENS, JR., PETER HENDERSON,
TOM LAURIE and PETER WAGNER

were called as witnesses herein, and after first having been duly sworn, was examined and testified as follows:

MR. NAFICY: Before we get started I think it might be useful to identify the testimonies that have been filed by these individuals so we have a reference for numbering.

We have direct testimony from Laurie and Wagner; and then rebuttal by Wagner. Then direct of Stephens; and then direct and rebuttal by Henderson.

So, should I go one by one and you give it a number?

HEARING OFFICER FAY: If you would, describe it and I will assign an exhibit number to it.

MR. NAFICY: Okay, so there's testimony of Tom Laurie and Pete Wagner.

HEARING OFFICER FAY: Exhibit 274.

MR. NAFICY: There's testimony of Dr. John Stephens.

HEARING OFFICER FAY: 275.

MR. NAFICY: Testimony of Dr. Henderson.

HEARING OFFICER FAY: 276.

MR. NAFICY: There's rebuttal testimony of Dr. Henderson.

HEARING OFFICER FAY: 277.

MR. NAFICY: And then there's rebuttal testimony of Dr. Wagner.

HEARING OFFICER FAY: 278.

MR. NAFICY: Now, we did have attached to Dr. Henderson's testimony an exhibit which was transcript of a previous testimony he'd given in a different case. It was attached as exhibit to that testimony. So I don't know if you want to treat that separately or -- and that was on the Gunderboom. I don't know if you want to do that separately or give it -- or stay with the same number.

HEARING OFFICER FAY: Why don't we give it a separate number.

MR. NAFICY: Okay.

HEARING OFFICER FAY: That will be -- could you identify the document.

MR. NAFICY: Yeah, it's testimony of Dr. Peter Henderson on the Gunderboom. And it bears on top the number 99-F-1164.

HEARING OFFICER FAY: Okay, is there a date on the cover?

MR. NAFICY: No, no, it just -- no.

HEARING OFFICER FAY: All right. So that's exhibit 279.

MR. OKUROWSKI: Can I ask one clarifying question, Mr. Naficy?

MR. NAFICY: Yes.

MR. OKUROWSKI: There were also two reports from Pisces. Are those part of somebody's testimony that has already been entered in the exhibits? Because it came in in the package of the testimony.

MR. NAFICY: Yeah, we actually had meant those to be attachments also to Dr. Henderson's. Why don't we go ahead and number those, as well.

MR. OKUROWSKI: I think that will be clearer.

HEARING OFFICER FAY: Okay, as precise

an identification as you can.

MR. NAFICY: You know, I'm afraid -- okay, I don't have that right in front of me, but one of them is called the use and abuse of density dependent models for the assessment of the impact of power station cooling water intakes on fish populations. February 2001.

HEARING OFFICER FAY: And that's exhibit 280.

MR. NAFICY: 280. I'm sorry, I need to dig up the other one, but while they testify I'll find it and then we can renumber it.

HEARING OFFICER FAY: Okay, fine.

MR. OKUROWSKI: It was on Gunderboom. If we just want to generally say it was a piece on Gunderboom, and then we'll get --

MR. NAFICY: Right.

MR. OKUROWSKI: -- later.

MR. NAFICY: It was --

HEARING OFFICER FAY: And that's separate from Dr. Henderson's piece on the Gunderboom, right?

MR. NAFICY: No, Dr. Henderson is a principal at Pisces, but so it's not very separate. It's one is a report and the other one is a text of the testimony.

HEARING OFFICER FAY: Okay, but it's a different document?

MR. NAFICY: Correct.

HEARING OFFICER FAY: Okay.

MR. OKUROWSKI: And then, Mr. Naficy, there were some letters that came in in the rebuttal testimony --

MR. NAFICY: Yes, I'm actually still getting to that.

MR. OKUROWSKI: Great.

MR. NAFICY: There were two letters by Mr. Joe Giannini and Mr. Richard Smith, and I showed the two letters to counsel for all parties. And offered to offer these folks for cross-examination, then intended to introduce these into evidence.

And counsel indicated that they would waive cross-examination, and would not object to introducing them into evidence. So I would now move to introduce those two documents into evidence.

HEARING OFFICER FAY: Okay, would you identify each one?

MR. NAFICY: One is a letter from Joseph

C. Giannini dated May 11, 2002. And the other is a letter from Richard F. Smith dated May 9, 2002.

The latter, I don't know if you can call it a letter. It's more like a statement.

HEARING OFFICER FAY: Okay, the first letter is exhibit 281. And that's the Joe Giannini letter.

MR. OKUROWSKI: I thought that was the second report, that was the Gunderboom report on Pisces. I thought that was 281.

HEARING OFFICER FAY: I did not identify that report with a number.

MR. OKUROWSKI: Thank you, okay.

HEARING OFFICER FAY: So that the Joe Giannini letter is 281. And the Richard Smith letter is 282.

And I understand Mr. Naficy is going to find that report and identify it for us after a bit.

MR. NAFICY: Yeah, at some later point today.

HEARING OFFICER FAY: Okay.

DIRECT EXAMINATION

BY MR. NAFICY:

Q I'm just going to ask from both of you gentlemen a series of standard questions, and then you can get into introducing yourselves and giving a brief description of your background and experience.

But did each of you prepare the testimony that bears your name?

DR. STEPHENS: Yes, I did.

(Off-the-record discussion.)

MR. NAFICY: Okay, that's fine.

Okay, and are the facts stated therein true and correct to the best of your knowledge? Just you, Dr. Stephens.

DR. STEPHENS: Yes.

MR. NAFICY: And are the opinions contained in there your best judgment?

DR. STEPHENS: Yes.

MR. NAFICY: Okay, now, if you could please just introduce yourself by talking briefly about your background and experiences.

DR. STEPHENS: I've lived in California all my life. I received my BA from Stanford University; my MA and PhD from UCLA. I retired as the James Irvine Chair of Environmental Biology from Occidental College six years ago.

I am today the Executive Director of the

Van -- Research Group which I started in 1974 while at Occidental, doing environmental research as a nonprofit group arm of the college.

I've studied the fishes of California for 40-some years. I guess that makes me the old person around here.

I would like to just add as a parenthesis here, I'm suffering from an ear disease right now. It acts up. My balance is a little crappy and my hearing is terrible. So if you want to address me, make sure I get the question.

My interest is systematics and ecology of fishes. And I'm responsible for the longest database in California with regard to coastal marine fishes. That's all I'll say at this point.

MR. NAFICY: Are you involved as a consultant on any projects currently?

DR. STEPHENS: I'm working as a NOAA panelist on the expansion of the airport runway in San Francisco Bay. I was there last week. I'm writing two chapters on the ecology of fishes of California, and a few other little things going on.

MR. NAFICY: Thank you. Could you just

describe your testimony that was filed in this case?

DR. STEPHENS: A lot of my testimony basically agrees with Peter Raimondi. If you consider Morro Bay a unique resource, and everybody has, and everybody talks about it as a national treasure, that sort of thing. To allow a power plant to remove fishes from it for 50 years in the intake and in impingement, I might add that I can't believe that impingement has no effect. We only have two years of studies of impingement on this plant. And one year was quite different from the most recent year.

Impingement, in my estimation, is a pretty good representative of proxy for density and abundance of fishes in a particular area. I studied impingement at King Harbor and a number of the power plants in southern California.

One of the most interesting things I found, we had done quarterly transects for 25 years on the population in King Harbor. We looked at the impingement data and found that for those species that are vulnerable to impingement, the data was almost identical. I could have just sat out at the water and enjoyed the sunshine, because it was picked up almost the same data.

So, impingement is a good source of population data. I'm not sure why impingement seems to be so unimportant here, other than perhaps there's not much of a population in the bay, today. And that, of course, could be the result of 50 years of effects of a power plant. I don't know.

We are data poor is the problem. As many people have mentioned, we have no basic data from the 1950s when this plant was started. We don't know what was there. We have sporadic sampling within the bay, using different techniques which are not comparable.

We have a water trawl study by Fish and Game which was sort of jerry-rigged. They didn't use the same samplers; they didn't use consistent sampling; they didn't use -- nothing about it was particularly consistent. But they did give us a series of years from these water trawl studies, so there's a little data there.

So what I've said is that the little bit that we have suggests, at least from entrainment and entrapment, that the bay is negatively affected. I don't say significantly negatively affected at this point, but it is negatively affected.

We need data.

For the last five years since I've been up in this area I've been trying to have some significant sampling done in Morro Bay. It hasn't been done. It has not been done now, and it may not be done in the future. But I don't think we can make judgments based on a reasonably good larval study without some look at the distribution of the adults.

Even the larval study has a problem in that today they have talked about the distribution of larvae in the back bay, but they don't have any larval samplers in the back bay. All of the larval samples were in the central or mouth of the bay; none of them are in the back bay. So we don't know what the distribution of larvae in the back bay are in the first place.

My feeling is in a data-poor situation like this that we should err on the side of conservancy. I think that we should, you know, not license another 50 years of operation of the cooling water intake unless we're sure that there hasn't been an effect.

And though Duke's presentation continually says that there is no effect, or that nobody has demonstrated an effect, I agree with that, nobody has demonstrated an effect because no studies have been done, and that's data poor.

I think that's the summary.

MR. NAFICY: Thank you. I think I'll just move on to Dr. Henderson next, and I'll ask the same series of questions and then you can talk about your background and experiences; and we can try to share this.

Did you prepare the testimony that bears your name, both direct and rebuttal?

DR. HENDERSON: Yes, I did.

MR. NAFICY: And the report that is filed from Pisces and also the direct testimony, the testimony that we've filed, the transcript on the Gunderboom, were those also yours?

DR. HENDERSON: Mostly so. The report on the Gunderboom was me with other people from my company.

MR. NAFICY: Are the facts contained in the various testimonies and reports true and correct to the best of your knowledge?

DR. HENDERSON: Yes.

MR. NAFICY: And are the opinions contained in these reports your best professional judgment?

DR. HENDERSON: Yes.

MR. NAFICY: Okay, could you please give us an explanation of your background and professional experience.

DR. HENDERSON: Well, my name's Peter Henderson. I'm a Director of Pisces Conservation, Ltd., a consultancy and software company in southern England. I'm also a Senior Research Associate in the Department of Zoology at the University of Oxford.

I have a degree, a PhD from Imperial College, London. I specialized in population dynamics. And from there I went to work as a mathematical modeler for 14 years for the Central Electricity Research Laboratories where I specialized in impingement and entrainment effects and discharge issues linked to modeling of thermal discharges.

My own personal interest is really in the population dynamics of estuarine and flood plane fish. I've been working for about 23 years now, sampling monthly in the Bristol Channel basically studying both the effects of the power plant and using entrainment and impingement data to understand fish population dynamics.

I've also been working for about 20 years in the Central Amazonia on the flood plane dynamics of fish. And was the Manager in Charge of the Fisheries, the program for the Mamirrolar Reserve, which is the largest flood plane nature reserve ever set up in the world.

Presently I'm working for River Keeper in the Hudson Estuary as part of the Hudson River Settlement Agreement. And I'm also working for River Keeper on the 316B proposal rules for existing plant.

Other than that I think I've given a fairly reasonable summary of what I'm presently doing. And I've also been working on other power stations in the New York area, including the Astoria Repowering Project where I was an Advisor for the NRDC.

MR. NAFICY: Okay, now we have an agreement, and this is generous, that since Dr. Henderson has flown here from England for this testimony, that he be allowed to give his direct testimony on the Gunderboom.

But I'd like to separate that and leave that out of this initial discussion, which is going to be a summary and explanation of his testimony, both what he's filed in direct and rebuttal.

DR. HENDERSON: I start really from the premise that I believe that estuaries are a particularly important habitat for marine fish and crustaceans, and I believe that everybody who works on these systems would agree with me there.

There are nearly always areas of exceptional high productivity, and nearly always areas which are nurseries for marine fish.

Looking at the actual data, which we have, which is modest for the existing power plant here, it certainly seems that impingement is not great, but entrainment certainly seems to have a potential to be an important issue since the numbers of individuals killed are really very large.

I've really gone on to consider whether or not dry cooling and the reduction to almost zero in the amount of water used would be the best procedure. And I believe it would be the best way of running this plant in the future, were it to be built here.

Now, the real reason for this is that because of the size of the estuary, which is very small relative to the amount of cooling water required, we end up with really quite high proportional mortality rates of the estuarine species.

Now, while these proportional mortality rates are difficult to estimate, I personally find the evidence that the rates are in the range of 17 to 33 percent for the estuarine species really quite compelling.

I also feel that it's going to be towards the upper end because I find this idea of using the average age of entrainment really rather wrong to me, because of the way the animals would naturally be dying, that will tend to bias you towards using a shorter time for vulnerability than is actually the case.

Now, moving on from there we do have a real problem in trying to assess whether these mortality rates would truly damage the populations. We have no clear theory on which to base our analysis, nor do we have experience that allows us to actually say what level of mortality populations and systems can take without incurring real damage.

However, I think there are some real indications that here there are -- the levels are sufficiently high that we can anticipate some damage to the system.

My main thought here was that essentially mortality rates are at different levels in different species. This is, in some sense, rather like competitive system where you're taxing some shopkeepers much higher than other shopkeepers. It's pretty obvious the one that's got the highest tax on them, which for the fish is the mortality rate, is going to go out of business.

And I think, therefore, the most likely aspect, when you've got these sorts of mortality rates is that there's a real chance of a simplification of the system with some species which would have been able to compete adequately, being pushed out of business and disappearing.

Now, when do we expect this loss to occur. I think generally speaking it's the longer lived and lower fecundity forms which would go first. So, I would expect essentially a simplification of the system and a movement towards short life cycles, high fecundity forms which are more adapted to withstanding higher mortality rates.

With this, I think we could also anticipate to a certain extent, given the amount of productivity removed from the system, a shortening and a simplification of the food chains. Simply because there will be less moving up to the top predators.

The net result overall would be a simplification of the system resulting in a loss of resilience to change. And the point is often being made that estuarine ecosystems have to withstand considerable variability, and they certainly do. And in many sense they certainly are robust.

But I think they do need this robustness, and I feel there is considerable possibilities that what's actually happened here is the existing plant and the proposed future plant has actually reduced the resilience and helped cause a deterioration of the local ecosystem.

Now, if the entrainment which has

occurred is actually not affecting the fish and crustaceans in the estuary, and given the fact there is such a high number of animals killed, we then have a problem of saying well, why not, how could you kill so many things.

Therefore, hidden within any argument that it doesn't affect the population is a concept of a compensatory response, although it is argued that taking a very conservative view, they don't need compensation. If fact, you've got to have compensation if you actually think there's no effect.

Now, I feel that there's a real problem with any sort of argument which is based on compensation which is that if the power plant is taking animals, then something else is not having them. Essentially I don't really believe that there's true level of free resource out there which man can take without taking it away from some other mouth, really.

And hence, in this respect, as well, I believe we end up with a simplification of the system, and probably a loss to a certain degree of predators from it.

So, in summary, I find the mortality

rates compelling and that from that I think that there's a real reason to believe that the present plant has, and the future plant would materially affect the productivity and the diversity of the Morro Bay system.

MR. NAFICY: Dr. Stephens is wondering if he can add a point to his testimony?

HEARING OFFICER FAY: Add a point to his testimony?

MR. NAFICY: Yes.

HEARING OFFICER FAY: That he did not prefile?

MR. NAFICY: No, that he just didn't mention right now.

HEARING OFFICER FAY: Oh, sure. And I --

DR. STEPHENS: It has --

HEARING OFFICER FAY: Just a second, Dr. Stephens, excuse me. Let me know when you want to address Dr. Henderson's Gunderboom testimony.

MR. NAFICY: We will as soon as Dr. Stephens is done.

HEARING OFFICER FAY: -- have that document, yeah.

DR. STEPHENS: One thing that nobody has

really discussed here is the fact that the fish population, the fish assemblage in Morro Bay is made up of almost no facultative estuarine fishes. All of these pretty much are coastal fishes that happen to make use of this estuary because of its very high productivity. Things like top smelt are using direct access to primary productivity to produce high biomass. And they are the species with the largest numbers in abundance.

What mortality is taking place, and one of the major functions of an estuary is for broadcasting or exporting larvae to the coastal zone. It happens to be an area of very high productivity, as mentioned. And this productivity leads to enhancement of the coastal environment. And many many of these species that are being picked up by the intake are on their way out of the estuary, not going back to do anything to the estuarine population, per se.

So, I think the reason we're not detecting an effect on the estuary is because these are being exported to the coastal environment. And the effect is out there, where it's going to be much more difficult to show.

MR. NAFICY: Thank you.

So, Dr. Henderson, could you just briefly go over your testimony that you have filed on the Gunderboom.

DR. HENDERSON: Yes, --

HEARING OFFICER FAY: Before we do that I just want to ask you, Mr. Naficy, is that the one that you couldn't put your hands on that we had not identified yet, is that Gunderboom Fallon Studies in Bowline Pond?

MR. NAFICY: Yes.

HEARING OFFICER FAY: Dated July 2001. That will be exhibit 283.

MR. ELLISON: Mr. Naficy, could I just make one comment that may or may not be helpful? It's intended to be, anyway.

I can tell you right now we've reviewed Dr. Henderson's Gunderboom prefiled written direct testimony, and we do not have any cross-examination based on that. So, if he wants to just put that in the record, there will be no issue about him having to return from England to be cross-examined when the Gunderboom hearing returns, at least on our part. The other parties will have to speak for themselves.

I'm saying this because if he -- we've

had this issue about people going beyond their direct, and saying new things. And I just want you to know that there's a risk, before you do it, there's a risk that if you go beyond what's in the direct that that might change where we are, at least, with respect to that issue.

MR. NAFICY: We will go back on the position that -- you're saying that you will not cross-examine him now, that you want to just reserve the right to bring him back if you, at a later date, decide that he went beyond the scope of direct?

MR. ELLISON: No. What I'm saying is our agreement that this can come in now, and that he does not -- would not have to return to be cross-examined, is based upon what he filed.

I'm just saying if he says something new, it depends on what he says, but if he says something new that might change our view on that.

HEARING OFFICER FAY: They don't have their experts with them.

MR. NAFICY: I understand. Let me privately admonish him for --

(Laughter.)

MR. NAFICY: We are prepared to go

forward.

HEARING OFFICER FAY: Okay. Go ahead.

DR. HENDERSON: On the grounds that I couldn't think of anything more delightful than coming back here again.

(Laughter.)

DR. HENDERSON: The Gunderboom is a system for keeping out some effectively larval fish and eggs from power station intakes. It consists of a curtain of a geotextile. We were concerned with an analysis for River Keeper of the Gunderboom studies which had been undertaken at the Lovett Power Plant in the Hudson Valley. And our particular interest was to go on from there with the proposed use of the Gunderboom at Bowline Three, which was a small power station proposed and built.

So we undertook a study working with the Gunderboom people to actually see whether or not the Gunderboom would foul. Our major concern and why we brought up the fouling issue was that our analysis was that the geotextile of the form they were using would severely foul quite quickly. As fouling organisms grew on its surface it would not be able to transmit the volume of water required for the cooling system, and it would fail.

We felt quite confident that this would occur for really two reasons. One, the actual experience at Lovett demonstrated that it did fail in this sort of way. Essentially the figures which are often quoted that it has an 80 percent success at keeping out larval fish was when it was partially working as a skimmer -- because the top buoys had sunk underwater. They had sunk underwater because that's one of the ways in which it fails when it gets blocked up.

So in Bowline Pond, the area directly in front of the proposed cooling water intake point for this new station, we undertook some fouling studies. We used static panels of the Gunderboom material for about 30 days. And also the Gunderboom corporation put in a test rig where they had a piece of the Gunderboom material in which they could pump water through it, and also could clean it, using their own air burst clearing system.

We pulled up bits of the panel every ten days so we had effectively measurements of the permeability of the material at 10, 20 and 30 days.

After ten days there was very little fouling, and the permeability of the water was almost exactly as it had been when it was clean.

After 20 days we noticed more of the holes on the Gunderboom were beginning to get filled with tube-building crustaceans. I should add the Gunderboom material has 1 mm holes, this particular variant of it, drilled in it, which actually gave it its enhanced permeability. They were a perfect size for corophium to live in, and they basically filled every hole.

The surface was also becoming to get covered with various bacteria, fungi and such like.

By 30 days, the permeability had been severely impaired and mussels were beginning to grow on the surface, and a whole range of bryozoans and other marine fouling organisms. Essentially rather as you might imagine from rope hanging from a buoy or buoy, sorry, in the water.

Now, the interesting aspect was that at the end of the 30 days, Gunderboom's test rig was removed, the idea being that because it had flow and it had the air burst system, it would not have fouled. In fact, it came up really looking like a carpet covered in bryozoans.

And when we tested that, it had lost 96 percent of its ability to pass water with a 10 mm head. In other words, it was almost completely fouled and was unable to pass any water through it to any intents and purposes.

So, effectively we concluded that the Gunderboom material was in severe danger of fouling, particularly in rich estuarine waters. And that it really was not an established technology that could be used to effectively keep out fish.

In practice three things would probably happen. As it builds up fouling and hence can no longer transmit the water, the top will sink underwater, and you lower the top and the larvae will enter, larvae will enter the station.

Alternatively, if you've got a sandy bed, you'll get burrowing underneath it. And this is also being observed at the Lovett station because obviously water will start to tunnel. And as it starts to tunnel underneath, it gradually digs and bigger and bigger hole, and then starts rally roaring under it. It finds the area of least resistance.

Thirdly, and this has also been observed at Lovett, holes will develop in it. It will break through. In fact, marine life is actually able to help to damage it, I think.

The other and final aspect of this which concerned us was the term looking on the surface of the Gunderboom. As I've already said, we had a lot of corophium living there, filling up the holes in it. We also noted the existence of some species of ostracod there, and other life, which are actually predatory, or potentially predatory on larval fish and fish eggs.

Therefore, it seems to us that there was a real risk as bioform developed that you would actually develop a predatory community there which would effectively harvest the eggs and larvae pulled towards the surface.

I think that's an adequate summarization of it.

MR. NAFICY: Okay, now given the arrangement I think we will make the two gentlemen available for questioning, and then go on from there to our next witnesses. Unless you want to do it a different way.

HEARING OFFICER FAY: Their subject is

different?

MR. NAFICY: Well, --

HEARING OFFICER FAY: The other two witnesses?

MR. NAFICY: They're generally the same.

HEARING OFFICER FAY: Well, I think it might be more convenient for the other parties to just be able to ask whoever in the panel is knowledgeable.

MR. NAFICY: Okay.

HEARING OFFICER FAY: So why don't you go ahead with the other witnesses.

MR. NAFICY: Okay.

(Pause.)

MR. NAFICY: I'm sorry about the delay.

So, Mr. Laurie and Dr. Wagner, I'm going to ask you both of these questions, and just please speak into the microphone.

Did the two of you jointly work on the document that we're calling the direct testimony of Pete Wagner and Tom Laurie?

MR. LAURIE: Yes.

MR. NAFICY: And are the facts contained in that document true and correct as best as you know?

DR. WAGNER: Yes.
MR. LAURIE: Yes.
MR. NAFICY: And are the opinions contained therein your best judgment?
MR. LAURIE: Yes.
DR. WAGNER: Yes.
MR. NAFICY: And I understand, Dr. Wagner, you filed some rebuttal testimony that bears your name. Did you use any of the calculations that Mr. Laurie has made in writing some of the conclusions in there?
DR. WAGNER: Yes, I did.
MR. NAFICY: And did you check the facts on your own, as well?
DR. WAGNER: Yes.
MR. NAFICY: So were they true and correct as best as you know?
DR. WAGNER: As best I know, yes.
MR. NAFICY: Okay. So the opinions you formed in that rebuttal testimony, are they your best judgment?
DR. WAGNER: Yes.
MR. NAFICY: Okay, with that introduction, before I allow the witnesses to kind of give a little bit of a background about

themselves and their professional experience, I want to just -- just one housekeeping matter.

The testimony that was filed by the two gentlemen earlier contained some calculations that were then revised after Duke's announcement about the 370 million gallon per day annual cap.

Now, the rebuttal testimony that was filed refers to some additional calculations that too that 370 million gallons into account, but the calculations were not available in a form to be distributed as an exhibit.

I have those here. We don't necessarily want to introduce them because the conclusions are contained there. But if people want to see what those conclusions are based on, we have put the calculations in a form that we can pass out as an exhibit.

So I don't want them just to be looked at as though we're trying to put in an exhibit that wasn't prefiled. But if people want it, I can have it available.

HEARING OFFICER FAY: So these are the work papers that support the calculation?

MR. NAFICY: Correct.

HEARING OFFICER FAY: But the conclusion

remains the same?

MR. NAFICY: Correct, well, the conclusion in the rebuttal remains the same.

HEARING OFFICER FAY: Okay.

MR. NAFICY: Yes.

HEARING OFFICER FAY: All right.

MR. NAFICY: So, I can either pass it out now, or we can talk about it, or whatever is your pleasure.

HEARING OFFICER FAY: I'll leave it up to the parties if they want to see the work papers made available.

MR. ELLISON: Let me suggest this. I don't know, actually can I just have a moment to consult with --

HEARING OFFICER FAY: Sure.

MR. ELLISON: Thank you.

HEARING OFFICER FAY: Let's go off the record.

(Off the record.)

MR. NAFICY: Should we go forward or should we wait for the Commissioner to come back?

HEARING OFFICER FAY: No, I think we can go forward. What was agreed to is that copies of the work papers have been distributed, and the parties will address these at a later time if they feel the need to.

MR. NAFICY: So, Mr. Laurie, why don't you begin. Give us a little bit about your background and involvement in this case.

MR. LAURIE: My name is Tom Laurie. I'm ashamed that I don't have a PhD, but I did take a masters degree in physics at the University of California at Irvine in 1970. I maintained a 100-ton Coast Guard license and ran fishing boats for five years thereafter.

And I eventually became a general contractor, which is how I've made my living since then. I've lived in the Morro Bay/Cayucos/Los Osos area for 25 years. And I'm very fond of the estuary and very interested in the processes which govern its destiny.

And I'm keeping my comments specifically to the reduction of the entrainment data that was provided in the 316B document because I don't want to step out of a field which may bring flak my way.

So I think I'm perfectly qualified to deal with these numbers. It's not rocket science. It's basically reduction using the methods that you could find in a first year calculus course.

But I did come up with different answers than the ones that were presented and published in the 316B, which I wanted to share with everybody.

DR. WAGNER: I'm Peter Wagner. I got my bachelors and PhD degrees in physics from the University of California in Berkeley. I won't tell you how many years ago.

I have taught physics and electrical engineering for approximately the last 40 years, starting at Johns Hopkins and ending at the State University of New York for the last ten years.

During this period I took a seven-year leave to direct what was then called the Center for Environmental and Estuarine Studies at the University of Maryland; now called the Center for Environmental Science. It comprises three regional laboratories, two of which are on Chesapeake Bay, a somewhat larger estuary than this one.

Also I spent a year on leave working for the State of Maryland, Department of Natural Resources. I was in charge with setting up an environmental monitoring program for monitoring everything essentially except the electricity that comes out of Maryland power plants.

And for about six years after that, I chaired what was called the Environmental Power Plant Research Program, which was essentially the funding body supported by the Department of Natural Resources in Maryland.

We're residents of Morro Bay. We love it. We don't want to see anything bad happen to it. We'd like to see it get better. Thanks.

MR. NAFICY: Okay, now, Mr. Laurie, could you explain the study that you prepared and your findings.

MR. LAURIE: After the discovery period had expired for data requests there were some inconsistencies in the methods in the reduction of the cycle data that was collected to calculate PMs for the ten targeted fish.

And I was fortunate enough to attend the October 11th technical work group meeting and fortunate enough, as a layman, to have the issue discussed a bit.

At that time I suggested -- my interest at that time was in the herring business, and I suggested that -- had the herring -- mortality algorithm worked itself so that the station two, which is the entrainment station densities could be averaged over a period of a week, that the mortality for herring would be considerably higher than it was eventually published to be.

And the answer I got was that the pairing of the samples was pretty much an absolute in time. In other words, in order to come up with a valid estimate of PM for a specific fish for a specific month, the sample collected, or the series of cycle samples collected at the entrainment station in that 24-hour period were matched with a series of cycles collected in the four source water stations during that same 24-hour period.

So, the other problem was that the November source water survey dates did not match the November 13th entrainment station date for the paired survey. In other words, the November 13th entrainment station -- or the November 13th entrainment station densities were matched with November 27th source water data, two weeks later.

So, I rang the bell on that, and the answer I got back was no answer at all. I tried to collect some cycle data from Duke through Mike Thomas of the Water Board, because, as I said, the discovery period had lapsed.

But I didn't get any response until about a month ago; we got a one-page document from Duke Energy to Mike Thomas to me which outlined the sample numbers that were for the entire year for all ten fish.

And there were so many problems with that one-page document, as far as the numbers go, that I decided to ignore it. Because they didn't square with the data that was actually published in the 316B document.

And I felt that it was fair to assume that the data, the numbers that were posted in the 316B document and the data which supported the numbers should be a sufficient last word for an analysis of the impacts.

But, it turns out that the cycle data was revised in this one-page document I got. And that the November survey date was actually moved over unofficially to allow for it to correct the error that was published in the 316B.

So, without any assistance from Duke Energy in providing the actual cycle data, which is basically 48 samples taken over six cycles in a 24-hour day for all the five stations once a month, we extracted the data from the 316B document as best we could. And recalculated the PM numbers for every fish using the algorithms that were supplied in the examples in the appendix of the 316B.

And we were able to check our work because we ran the first table using the published data and came up with the numbers that were actually published for the total impacts. And then we started working our corrections in from there using corrected fractional components and cooling water volumes.

So, the net result of my work was this, well, the first one I published was five tables; but this one is now nine tables because there's a few variations in it. And it also reflects the proposed cooling water cap reduction in table 6.

So the overall numbers we came up with are larger than the numbers that were published in the 316B document. And there's some interesting relationship between the cooling water reduction proposed from 475 million gallons a day max to 370 million gallons a day max, which is a 22 percent reduction.

It didn't, according to the results we

got in our calculations for the final PMs for all ten fish, the cooling water reduction of 22 percent doesn't translate to a mortality reduction of 22 percent. It translates to a mortality reduction of 19.5 percent at the mean length, and 14.1 percent at the maximum length.

So, that was an interesting observation, that cooling water reduction isn't a linear thing. So, the impacts need to be studied outside of just a straight-across tradeoff in cooling water reduction.

MR. NAFICY: Okay. I'm going to ask you, Dr. Wagner, to first, if you want to add anything to what Mr. Laurie just said. And then also get into the rest of the testimony that you've filed.

DR. WAGNER: Yes. If anybody doesn't know, PM is proportional mortality. Although it's been used all day, and I suspect it's familiar.

The paired sample methodology might or might not be familiar to the viewer or the audience, although I'm sure it is to the panel. Just to remind everybody, the idea is to sample the organisms taken in by the power plant at station two. To sample the organisms in the source water. And to divide one by the other. And this is called the entrainment percentage. That goes into a rather complicated formula that ends up giving you the PM.

The problem that Tom first spotted and pointed out was that the samples taken at the entrainment station were not time-coincident with the samples taken in the source water.

Samples were taken every week at the intake to the power station, but just once a month in the source water.

In one case, one particular month, the samples taken at the power station were displaced by more than two weeks from the source water, which made it questionable to take the ratio.

In three other cases, three other months, there were also discrepancies. The source water was sampled over a period of a week, but the entrainment sampling was only at one point. All that Tom really did was to average the entrainment sample over the same week that the source water was averaged. And that's part of the correction you'll see in these tables.

I'd like to go on, if I may, and I'll limit my comments to the rebuttal statement. I believe we're rebutting, I think it's exhibit 266, Duke Energy aquatic biological resources testimony, is that correct?

MR. NAFICY: Yes.

DR. WAGNER: And my rebuttal testimony is really ours because Tom helped, too, is number 278, which I'll just, since you've seen it I'll just review it and summarize it very briefly. By page number and section number.

Section 2.2, page 11, has some statements with which we disagree. The first is that there's no evidence of adverse impact over half a century of operation.

We don't disagree with that; it's true. There's no evidence of any impact over half a century of operation because there were no measurements made half a century ago.

This same consideration applies on pages 36 and 37 where they talk about impingement. The problem is that the power plant has been fishing, some call it cropping, for close to 50 years. So you don't know, none of us knows what species abundances, what diversity would have been there if there had been no power plant 50 years ago.

You cannot infer that the plant has been benign because you don't know what was there before its advent.

The second statement that we dispute is that, and I'm quoting, "larval abundance is limited not by supply, which implies mortality, but by habitat size; therefore, habitat enhancement is the best mitigation."

There's no evidence for that. That's simply not supported by evidence. It's pure conjecture.

Turning to section 6.1.1, we had some trouble with definitions or determinations of the source water. For example, in the figures in tables 1 and 2 indicate much larger volumes of source water than were found by Hultner in the Phillip Williams, Associate, report in June of 1988.

Hultner's estimate of static volume is 1500 acrefeet below the zero elevation or mean low level water; TetraTech's number is 4394 acrefeet. That's quite a difference. And it has a profound effect on the PMs.

Moreover, we ran into some trouble understanding the rather high figure of 75 percent that I believe Dr. Jay calculated and was used in calculations for the so-called tidal exchange ratio. That number means that 75 percent of the water that comes in during the day on the incoming tide is new water. That's what that means.

When you look at I believe it was appendix C of applicant's 316B submission, we found that some of the datapoints for the tidal exchange ratio were rejected because they were too low. And in some earlier answers to data requests, some other datapoints were rejected because they were negative.

Now, in the methodology that was used, which is basically using salinity changes as a surrogate for the motion of water, you can't have a negative number. So maybe Dr. Jay will comment on why that number is negative, and why selectively those figures were thrown out. It sounds like the tide was going the wrong way. So we have a lot of trouble with that.

Moreover, if you look at something called the Bray-Curtis Dissimilarity index, which, in the 316B is table 3-3, page 318, you find that the dissimilarity between species -- we can define that if you want to, but I think the professional people know what it is -- it's a parameter, it's a variable you calculate that is unity for very dissimilar species between two stations, and zero if they're very similar.

If you look at stations one and two, remember station one was at the mouth of the bay, and station two is at the power plant, they are very similar. Well, that's what you'd expect.

If you look at one and two, or one or two, versus station five downshore, they're very dissimilar. Now, the only way I can see that that could happen would be, in fact, if there wasn't a whole lot of mixing, offshore mixing, that's showing up at stations one and two.

If there were you would think that the dissimilarity between one and five would be much smaller. So that was another reason to make us wonder if the tidal exchange ratio was, in fact, as large as .75. I believe the Bray-Curtis issue was not, at least to our satisfaction, explained.

I don't know if it's worth going into, but since applicant brought it up, I suppose we should. On pages 43/44 and 67/68 the applicant asserts that the assumption of 100 percent mortality for entrained organisms is unduly pessimistic. And cites survival rates of up to 80 percent in other studies.

These survival rates, as far as we could tell, are not fully backed by literature citations, although there are some. The EPRI reference included there was not attached to what we received, so we couldn't check up on that one.

The problem there is that I think everybody would admit, that results from elsewhere, from other estuaries, other temperatures, other climates have to be taken with a grain of salt; because survival, going through a power plant cooling water system, is idiosyncratic to the individual situation. And it's not necessarily valid to assume that because larval survival was 20 or 30 percent somewhere else on Chesapeake Bay, that it's going to be 20 or 30 percent on Morro Bay.

I guess my question, being an experimental physicist, is why in the world didn't they measure it. It is a measurable -- it's not easy, but it is a measurable thing. It looks like the methodology, if somewhat difficult, is completely straightforward. You know the transit time through the power plant. When the power plant is off you get one value; when the power plant is on, you get another value. Just simply by looking at what percentage of the organisms going in came out at the other end alive one transit time later. So, I have a problem with that.

In summary, we do accept the mortality estimates by CEC Staff for the ten targeted species. And we reject the applicant's arguments that the CEC figures are too high.

Tom, as you'll see when you study this spreadsheet, has applied all kinds of corrections to them, including correcting to go down from, what was it, 417 to 370 average mgd's. And we find absolutely remarkably that the mortality estimates of the consultants turn out to be the same within a percent or two. That's a remarkably robust outcome.

I think that's all I have to say.

MR. NAFICY: Thank you. I'll make the panel available for cross-exam.

HEARING OFFICER FAY: Okay, thank you. Do you want to move all those exhibits?

MR. NAFICY: Oh, actually, I do, yes. Could we have all of those entered, please, into the evidence.

HEARING OFFICER FAY: So that's exhibits 274 through 283.

MR. NAFICY: Yes.

HEARING OFFICER FAY: Okay, is there any objection to receiving those? I hear none, so moved.

And the panel is now available for cross-examination, however we'd like to take a short break. I say short because we have some food next door. And it might take a little more than ten minutes to get a snack, but you're welcome to get a little snack in case we end up going another hour and a half, we don't want you to be too hungry.

So, we'll see you back here in 15 minutes.

(Whereupon, at 5:30 p.m., the afternoon session was adjourned, to reconvene at 5:45 p.m., this same day.)

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EVENING SESSION

6:00 p.m.

HEARING OFFICER FAY: Okay, let's go back on the record. Could you identify that exhibit, Mr. Naficy?

MR. NAFICY: Yes, it's called Turn the Tide for Morro Bay, Comprehensive Conservation and Management Plan for Morro Bay.

HEARING OFFICER FAY: That will be exhibit 284.

MR. NAFICY: Thank you.

HEARING OFFICER FAY: Mr. Ellison, you may cross-examine the CAPE witnesses.

MR. ELLISON: Thank you.

CROSS-EXAMINATION

BY MR. ELLISON:

Q I basically just have one or two questions sort of for each of you, so I'm going to kind of go left to right here, starting with Dr. Henderson.

Dr. Henderson, on the concerns that you raised about the Gunderboom, let me just ask you essentially one question. Do you believe that further research on the Gunderboom is a good idea?

DR. HENDERSON: Yes.

MR. ELLISON: Okay, thank you. Dr. Stephens, you testified that the larvae that are exported from Morro Bay serve an important ecological function in the larger coastal environment or something to that effect. Do you recall that?

DR. STEPHENS: Yes.

MR. ELLISON: Don't you think then that that's a good reason for analyzing the impacts of the power plant on a comprehensive basis that includes consideration of both the estuarine resources as well as the ocean resources?

DR. STEPHENS: I don't really because a lot of the ocean resources that are coming in are mesopalagic, they're not -- they're dead when they move in there. So that just confuses the issue.

I think we can talk about a population within the estuary and the effect of entrainment upon that population, at least on their exported larvae. But I don't think bringing in the coastal one makes much sense. If they're the same species you won't know the difference.

MR. ELLISON: So is it your position that we ought to consider the issues related to the export of larvae from the estuary, --

DR. STEPHENS: Yes.

MR. ELLISON: -- but not consider the reciprocal issues of coastal taxa that enter the estuary? Is that what you're saying?

DR. STEPHENS: Well, okay. There is the opposite direction that we can talk about; that is that some coastal fish larvae go into the estuary and the larvae serves as a nursery. But those generally don't reproduce in there. They usually turn around and migrate out after a year or two of nursery activity. So there's a function there.

And if they're entrained on the way in, that would be a problem, also. But these sorts of distinctions have not been made, as far as I can tell.

MR. ELLISON: Okay, but would you support generally a comprehensive look at these issues that considers the Morro Bay environment in the context of the larger coastal environment?

DR. STEPHENS: It would be difficult to do. I think everything should be looked at in the context of the larger environment, though.

MR. ELLISON: Okay, thank you. And is it Mr. Laurie or Dr. Laurie or --

(Laughter.)

MR. ELLISON: Okay, with respect to the concerns that you raised about the way the 316B study was done, isn't it true that you presented those concerns to the technical working group?

MR. LAURIE: Yes.

MR. ELLISON: Thank you. And, Dr. Wagner, you're familiar with the national estuary plan that was just discussed a moment ago?

DR. WAGNER: Yes.

MR. ELLISON: And you are a representative of CAPE here in Morro Bay, correct?

DR. WAGNER: No. I'm not a member of CAPE. I do support CAPE.

MR. ELLISON: Okay. Did you follow the development of the national estuary plan closely as a resident of Morro Bay?

DR. WAGNER: Yes, as a matter of fact I'm on two of their committees.

MR. ELLISON: Isn't it true that the -- were you here earlier when there was some questioning by Mr. Naficy about provisions of that plan that call for research into the impacts of the power plant? Did you hear that discussion?

DR. WAGNER: What time of day was that? I might have missed that.

MR. ELLISON: I don't know, my sense of time has --
DR. WAGNER: Because I did go out for awhile. So I don't remember it, but I might have been --
MR. ELLISON: In any event, there was such a discussion. Are you familiar or are you aware that there are some, I believe two or three items in a rather longer list of further research items that relate to the power plant?
DR. WAGNER: Yes.
MR. ELLISON: Are you familiar with how those were introduced into the plan? Did you follow that?
DR. WAGNER: I wasn't active in either the NEP or the affairs of CAPE at the time that happened. My understanding is that power plant effects were introduced fairly late into the evolution of the CCMP. Others may be able to answer that better.
MR. ELLISON: Well, that really wasn't my question. My understanding is that they were introduced at the last minute at the request of CAPE, isn't that true?
DR. WAGNER: I'm not sure it was at the

last minute, but, yes, that's my understanding, too.

MR. ELLISON: Okay, thank you. That's all I have.

HEARING OFFICER FAY: Ms. Holmes.

MS. HOLMES: No questions.

HEARING OFFICER FAY: Does the City have any questions?

MR. SCHULTZ: Ditto.

MR. NAFICY: I really think stars all around this time.

HEARING OFFICER FAY: And how. Do you have any redirect, Mr. Naficy?

MR. NAFICY: No. No.

HEARING OFFICER FAY: I do have a question of Mr. Henderson -- Dr. Henderson.

You were involved in the Bowline Three, analyzing BTA at that power plant, is that correct?

DR. HENDERSON: Yes, but only from the viewpoint of the Gunderboom and issues to do with entrainment. I don't know anything about the dry cooling engineering issues.

HEARING OFFICER FAY: Are you familiar with the State of New York Department of

Environmental Conservation that issued a decision March 19th finding the Gunderboom as BTA at that project?

DR. HENDERSON: Yes.

HEARING OFFICER FAY: And that seems to be at odds with the testimony you gave, that it was not working at the time that the project was being analyzed.

DR. HENDERSON: Yes, it is, isn't it?

(Laughter.)

HEARING OFFICER FAY: Can you help us out there at all?

DR. HENDERSON: Well, --

HEARING OFFICER FAY: You just disagreed with their finding, I guess?

DR. HENDERSON: Well, to be honest, yeah, I find the situation of New York DEC slightly odd, and one or two members are very keen on the Gunderboom. They view it as a technological solution to a very difficult problem of reducing entrainment at a plant where nothing much else seems to be possible to be done.

But, I think there really is a big disagreement about this issue. And that's all I can really say, is that quite a number of us think that it doesn't really work, and is truly an experimental issue and needs to be assessed more carefully.

HEARING OFFICER FAY: Okay, thank you. All right, that concludes our taking of testimony on aquatic biology, with the exception of keeping open the record for the mitigation proposal of the habitat enhancement plan and the Gunderboom.

The parties will inform me next week of their recommendations on schedule.

Are there any other preliminary matters before we begin taking public comment? We have about ten people that would like to make comments. So I thought we would get our housekeeping done before we began that.

MR. ELLISON: I just wanted to make clear that the record on the issues we talked about today, I understand, is closed, with the exception there were a couple of things that we agreed would come in.

For example, Michael Thomas said that he would have the Regional Water Board provide a letter from their attorney regarding the applicability of a code section.

And we talked about Dr. Raimondi and

Dr. Mayer getting together to develop that matrix of outcomes of different resolutions of the three disputed issues, things of that kind.

HEARING OFFICER FAY: Yes. I agree. Any other --

MR. OKUROWSKI: I also have one more question, Mr. Fay, over here.

HEARING OFFICER FAY: Yes, Mr. Okurowski.

MR. OKUROWSKI: Duke is having difficulty apparently being served when things are going to the Public Affairs Office. We tend to not get those documents.

So if I could ask when we all send information if it's okay to send it to Mr. Pryor or somebody else to make sure that they get docketed and entered into the docket record and distributed to the parties. It would just be easier.

HEARING OFFICER FAY: Well, the parties should be serving everybody directly. So, is it from CAPE you're not getting documents?

MR. OKUROWSKI: It's --

HEARING OFFICER FAY: CAPE should be serving you directly. And if they have an arrangement with the Public Adviser's Office, then I'd say it's CAPE's responsibility to be sure that the Public Adviser follows through.

MR. NAFICY: Actually, Mr. Fay, we've had this arrangement from before I got involved in the case, which was that we serve the Public Adviser on grounds of hardship, and that they distribute the documents not just to -- they're supposed to distribute the documents not just to the applicant, but to all the other parties on a long list.

If Duke wants, we can send it to them, as well, but we still -- it would be truly a great hardship for us to have to serve every document on everyone on the proof of service.

MR. ELLISON: Let me weigh in on this a little bit to say that we do not have a particular problem with CAPE serving the Public Adviser for the paper service.

But things, for example, like the motion that you filed last week, we would like to get an email copy, for example, or a fax copy or something like that, of those kinds of things. We have discussed, for example, and I'm not sure, Mr. Naficy, whether you were here or whether CAPE was represented by somebody else, but we did have a discussion about email service among the parties of testimony and other important things.

This was an issue for us last week with respect to that motion. It was filed on the 28th. We didn't -- as you know, we had the conversation on the 30th. I didn't even know it had happened, so.

MR. NAFICY: I do apologize for that, and that was, I believe we served the other documents by email before. And on that day was the one that we didn't, and we certainly intend to, in the future, serve everything by email, as well.

HEARING OFFICER FAY: And I'll just say, as an order from the Committee, that all the briefs will have to be served electronically, as well as in the normal course, so that parties get those as soon as possible.

I'll also call your attention to something Ms. Holmes mentioned. She is not listed separately on the proof of service, as is typical at the Commission, because you serve the Commission and distribution is made to the Commissioners and the Staff Counsel, et cetera.

I would specifically request that people, the parties, active parties, get her email address and serve her directly when you serve the proof of service electronically, so that at least electronically she can get a direct copy. In some cases that could save four, five days.

MS. HOLMES: Mr. Fay is probably making that request because in lieu of sending things to me, I call him and bug him until he send them to me. So I think he'd rather have you guys just give it to me directly than through him.

HEARING OFFICER FAY: I don't mind forwarding it on, but sometimes it's several days before she realizes that a document has come in. And it's just a very easy thing to add. I don't think there's any hardship there at all.

Okay, anything further, then, before we close the evidentiary record and take public comment?

All right.

PRESIDING MEMBER KEESE: Mr. Fay.

HEARING OFFICER FAY: Commissioner.

PRESIDING MEMBER KEESE: We do hear public comment every day on every issue. We have heard public comment the first two days of this hearing. And we have been totally liberal in hearing public comment on any issue.

Today -- well, let me make two observations. Yesterday we had very good response. Ten of our 15 speakers handled it in three minutes or less. Only two did we have to cut off at five minutes.

Today we have the very specific subject of marine biological resources. So we're going to be taking public comment today, please, on marine biological resources. And we would appreciate it, Mr. Boyd and I, who have an early obligation in San Francisco tomorrow and will be driving there tonight, would appreciate it if you could try to keep yourself to three minutes.

If that's a hardship for anybody speaking about the specific subject of marine biological resources, we'll be a little flexible. But three minutes would be nice.

HEARING OFFICER FAY: Okay. We'll begin. I understand we have a representative from the National Marine Fisheries Service, NMFS, Bryant Chesney.

MR. CHESNEY: If you permit me, I'd also like to talk about the alternative cooling. I could definitely keep it under three minutes, though.

PRESIDING MEMBER KEESE: Sure, that's fine.

MR. CHESNEY: Okay. I'd like to briefly summarize the views of the Fisheries Service regarding this project.

HEARING OFFICER FAY: And you're speaking on behalf of The Service?

MR. CHESNEY: Yes.

So under the provisions of the Magnusson-Stevens Fishery Conservation and Management Act, our service is obligated to provide what's called essential fish habitat conservation recommendations to federal and state agencies who either fund, permit or carry out a project that has the potential to impact, adversely impact essential fish habitat.

Now, according to this Act, in this particular case, Morro Bay is considered essential fish habitat for a number of federally managed fish species under the coastal palagics and the Pacific ground fishery management plans.

We're particularly concerned about sensitive habitats such as estuaries, wetlands that have been heavily impacted from human use, such as the case with Morro Bay.

We agree with California Energy Commission's final staff assessment regarding aquatic biological impacts. We also believe that the use of once-through cooling would have an adverse impact to essential fish habitat.

Based upon these impacts to essential fish habitat, and also in light of the fact that these impacts are occurring on a national/state designated estuary, and the fact that also these impacts are occurring on an already impaired water body, we believe that all feasible measures should be taken to avoid these impacts.

And I put this emphasis here on avoid rather than mitigate. And the Agency, the National Marine Fisheries Service's stand is that if you could feasibly avoid an impact, then you should do that rather than mitigate for it.

And that alludes to the habitat enhancement which I guess will be discussed at a later time.

Regardless, based upon the Energy Commission Staff's assessment and what we've heard over the past couple of days, we feel that closed cooling is a feasible alternative that would avoid these impacts associated with entrainment and impingement.

We've submitted letters to the Energy Commission Staff, the Water Board Staff and the Water Board directly with EFH conservation recommendations. And we'd now just like to re-emphasize our past recommendation that we think closed cooling should be implemented for this project.

If for some reason the Commission believes that closed cooling would not be a feasible option, then we'd like to be involved in the discussions for alternative methods, whether it's habitat enhancement or Gunderboom alternatives.

So that's basically it. Thank you.

PRESIDING MEMBER KEESE: Thank you.

HEARING OFFICER FAY: Thank you. Richard Smith.

DR. SMITH: I put that in at the end thinking you're going to turn the deck over, and you caught me with my pants down.

Gee, I hadn't quite thought. I guess what I'd like to do is remind us all of what an incredible resource we're talking about here. We get so much into the data and how to deal with the problem, that we forget.

I do have one document here from a collaboration of the Environmental Protection Agency, NOAA, Army Corps of Engineers, U.S. Fish and Wildlife Service, Natural Resources Conservation Services, some pretty heavy guns.

They state that three-fourths, 75 percent of commercial, shell and fin fisheries are estuary dependent, 75 percent. I don't think anybody's done studies on noncommercial fish species, but there's got to be a whole lot of them that are in one way dependent or another. There's an enormous, enormous dependency here.

I also have a document developed by NOAA and published by California Fish and Game in 1986. At that time the document states that 91 percent of California estuaries had been destroyed. Of the 13 primary estuaries remaining, two of them, one Morro Bay Estuary, the other one at Moss Landing, look to me on a map, spreading it out, cover about a 30 percent of the coastal region of California.

So, when we talk about this estuary by

those figures, I don't know if you want to split that, but somewhere in the vicinity of 15 percent or somewhere in the vicinity of 30 percent for these two Duke once-through cooling plants are impacting, presumably seriously, 75 percent of those resources on the coast.

It's a really big deal that we're playing with, and very few estuaries left to do this to.

Second comments, I don't see blue cards raising yet. Because I've never talked about my credentials here. I'm a Native American. And I was raised, my ancestors are the Chenate. And as I grew up, my grandfather taught us a great deal about the web of life.

And I want to tell you about one of the things that was brought today that he taught us. And that's the simplification of ecosystems.

I was so impressed I went on to get my PhD in animal behavior, memory and learning, and my minor was in ecology. And I was the Chairman and Developer of the Behavioral Ecology Center at the University of Utah for many years. Had my PhD in that field.

I was astounded. I had to get into

graduate school in the '60s before white men started understanding the consequences of simplifying an ecosystem.

Simplified ecosystem, I was taught -- well, I'll tell you the story. We had a white farmer that was right next to our farm. And that guy had decided to grow corn. It was a big deal in Michigan then.

And he got war surplus, one of the Caterpillar tractors; it was a big name for us, and we were real proud that we knew what these things were.

And my grandfather took us over there, after this beautiful Michigan forest and meadowland was cut down and was growing corn. And he said, how many ways can you destroy that corn field. And us kids guessed, and we had a whole list, practically anything will destroy a corn field, even keeping your hands off it. It dies every year and you have to replant it.

He turned us around and looked at our Native American area where natural crops were supported, and the diversity of habitat. And he asked us how many ways can you figure to kill our farm. And my cousin sang out, "a Caterpillar tractor." And that's about all we could come up with.

I've lived on this estuary on a boat since 1981. I'm out in it every day. Not necessarily in the kayak, although very often. I can assure you you can go over those mudflats and you won't find clams. They're not there anymore. They used to just be incredibly abundant.

You can flow for hours across eel grass meadows. I invite anybody here at any time to come out and test me on this. What used to be a biology experiment for my kid, drifting across meadows of eel grass where it was just abundant. You'll be very luck if you see anything. In three hours you might see a tern.

Yesterday I heard a guy, Bill Yates, who wants to be mayor again, I guess, talk about the phenomenal experiences of the bay, going off with pelicans diving and all sorts of wonderful life taking place, how abundant this bay was.

What he doesn't see, and I'm amazed at his naivete is this is desperation. This is what happens when silverfish come into the bay, -- sardines or anchovies, and everybody follows them, and it's an orgy of feeding. Those fish are coming in there trying to do nursery or reproductive functions. And then the bay jus stops. It's not what's happening in Morro Bay on a residential basis.

Thank you.

HEARING OFFICER FAY: Thank you.

PRESIDING MEMBER KEESE: Thank you.

HEARING OFFICER FAY: Jack McCurdy.

MR. McCURDY: Given the lateness of the hour and your need to travel I'll put my comments in a letter.

HEARING OFFICER FAY: Thank you very much.

PRESIDING MEMBER KEESE: Thank you.

HEARING OFFICER FAY: A gold star for Jack McCurdy.

(Laughter.)

HEARING OFFICER FAY: Walter French.

MR. FRENCH: I'd like a gold star, also, so I'll be brief. Honorable California Energy Commission and Honorable Citizens, it's a pleasure to speak with you today. And I appreciate the opportunity. My name's Walt French, and I'm a Business Agent for the Plumbers and Pipefitters here in San Luis Obispo County.

We pride ourselves on using common sense in our community. It is common sense to us that we do a nice plant modernization at Morro Bay. It's also common sense to us that the new modernized plant will have a water flow that will be less than the existing plant, therefore reducing aquatic mortality.

Therefore, we, the construction workers of San Luis Obispo County and their families, request you allow Duke Energy to construct a new power plant in Morro Bay.

Furthermore, common sense tells us that the existing power plant cannot be killing one-third of the aquatic life. If that were the case, much more of the aquatic life would be erased from the bay than exists.

We appreciate all the hard work by dedicated professionals to determine these percentages, but once again, common sense tells us to question their accuracy.

We request that the Board grant Duke Energy a license to build this new plant using the once-through seawater system for cooling. The plant will use less seawater, and therefore increase the habitat for aquatic life.

We also feel any habitat enhancement will be a real long-term improvement to the bay and future generations of Californians.

Thank you for your time.

HEARING OFFICER FAY: Thank you, sir.

PRESIDING MEMBER KEESE: Okay, two minutes gets a gold star, too.

HEARING OFFICER FAY: James Wood.

MR. WOOD: Good evening. James Wood, citizen of Morro Bay. I'm on the Morro Bay Harbor Advisory Board, but I'm speaking as a citizen.

Last night my sugar levels went like this. I went a little nuts. So I apologize for that. I ate tonight, everything's okay.

HEARING OFFICER FAY: Glad to hear it.

MR. WOOD: I'm against dry cooling. I think if we really want to save this estuary or preserve its longevity we need to do habitat enhancement. That's the only way to get it done. Because it's naturally silting in, naturally or unnaturally it's silting in. And if they want to keep it here, then they need to do habitat enhancement.

Connected to that is dredging. There's been some talk during the estuary program about possibly dredging some holes out there in the bay. It would help the flushing. And I've got to tell you, being as how we have to fight for our dredging funds every year in this harbor, we have to go to Congress and we have to pull some strings to get dredging funds. You know that they're cutting back on that every year, and we're just a little harbor in a big world. We have to fight for our funds every time we get dredging here.

They do not authorize dredging funds for sanctuaries. They do authorize dredging funds for working harbors and water-borne commerce; that's the benefit over cost that they use.

Tied to that is we have a small portion of remaining land on the waterfront down here that the City has adopted a plan, or the concept of putting in a boatyard and using the little bit of remaining land we have down here that's on the waterfront for water-borne commerce or a working harbor, which will help us get those dredging funds, which will help flush this bay.

So that's all tied in. And if we do get into habitat enhancement, and we do build a plant, and we do get to mitigation, you know, an acre for an acre, or an acre and a half for an acre and a half, I hope the acre and a half's, or the two for one's or whatever, are upstream where enhancement would be of some benefit. And we leave this property down here that's along the waterfront alone, for waterfront related uses.

Thank you.

HEARING OFFICER FAY: Thank you.

PRESIDING MEMBER KEESE: Thank you, and we are expecting to hear quite a bit more on this subject in our next series of hearings.

HEARING OFFICER FAY: Stephen Pryor.

MR. PRYOR: My name is Stephen Pryor; I'm a resident of San Luis Obispo. I really don't have comments, but I have some questions that linger in my mind.

Dr. Mayer over here stated earlier on that with a 33 percent drop in the plankton -- excuse me, a 33 percent kill of the organisms in the bay, how life would be diminishing so rapidly, it would basically happen before our eyes.

I think it has been happening before our eyes. And even if we go back to the 17 percent number that Duke Energy is using, it's still going to happen before our eyes. It's just going to take twice as long to happen.

Also I have an issue with the sampling sites that went into -- they used salinity models to look for residence times of the water in the bay. And then they used the five sampling sites throughout the bay and one outside of Morro Bay to look at the plankton populations and the larvae within those populations.

Well, none of those sampling sites was within either the 10- or the 15-day residence time areas of water. So, I'm curious as far as how they came up with their data that these 10- and 15-day residence times areas are acting as nurseries for any sort of larvae, when the data isn't there to back that up.

Also, from my understanding of what happens to water when it sits in a small area for some amount of time, is that in the summertime you have heat radiation, the water temperature goes up. Solubility of gas in water is inversely proportional with the temperature. So as the temperature rises the solubility of gas drops. Therefore you're having deoxygenation of the water.

So, in making the claim that these 10- and 15-day residence areas in the back of the bay are acting as nurseries, I would question the habitability of those water areas when they're sitting back there for 10 and 15 days, exposed in the summertime to solar radiation and deoxygenation; and in the wintertime to large infusions of fresh water.

Also I'd like to address the idea of surplus larvae output by fish populations. As fish evolve into their present modes of life cycles being fecundity, life spans, those sorts of things, incorporated within their success is the capacity to handle stresses in their environment.

So that surplus larvae out there is designed, whatever design, whether you look at God or evolution as the designer, is designed to provide that buffering capacity.

There was a statement, I'm not sure, by Dr. Cowan, that dealt with the -- I won't even go on to quote it -- it dealt with the egg load having to deal with the adult population and how the two are not related.

All things being equal, I don't see how the two cannot be related. If all stressors in an environment are equal, when you put out fewer eggs you're probably going to have fewer adults.

So I'd just ask you to question some of these assumptions that have been raised here today. Thank you very much.

HEARING OFFICER FAY: Okay, thank you.

PRESIDING MEMBER KEESE: Thank you.

HEARING OFFICER FAY: Barbara Jo Osborne. Is she here? Well, she left a note with it, so we'll file the note as her comments.

Mandy Davis.

MS. DAVIS: I can't guarantee I'll get a gold star. I would imagine this is the last time that I see all of you, so I would like to thank you for the attention that you've given me and for the time --

HEARING OFFICER FAY: We'll be down here again.

MS. DAVIS: I may not be here, though.

HEARING OFFICER FAY: Oh.

MS. DAVIS: But I know that a couple of you have heard this before. You've been inundated with facts, figures and a variety of other things where we're probably all yawning by the end of the day, so I have something pretty inspiring that I would like to read to you.

It's from a book called Wetlands.

"Here, where earth meets sea an interface of two worlds occurs, each giving life to the other, each defining the other. To stand on the edge of these two worlds is to be sometimes overwhelmed by the sights, sounds and smells of earth, water and sky as they coalesce into one enormous feast for the senses. Here one glimpses the powers of creation and receives, if attentive, an inkling of the mysteries of life. There is a palpable rhythm, constant, yet ever changing, moving in and out like a heart beating, though so slowly at times as to be almost imperceptible.

This is an absolutely poetic description of an estuary, and it's also a very true one. What is at stake here is absolutely huge, and I know that we all understand that. I've heard a tremendous amount of quibbling over numbers, you know, whether or not it's 10, 17, 33 percent.

But really, what has come out of all of this is the once-through cooling system has incredible impact on the estuary.

I am here personally, and I understand that this is a legal proceeding, and I understand that you need to stand on facts and legalities, and, you know, all this stuff, but we are human beings, we are within, we are part of our world. We are part of this particular ecosystem.

And ethics, personal and community ethics, are important. And our hearts are also important. And what we think and how we feel and how we feel we are connected to this. We are all connected to this. This is a very important decision that's being made.

Further, in this piece, I would like to read something.

"Before we begin to define coastal wetlands it is important to understand that ocean, continent and wetlands are all intimately connected in one large ecosystem. Although we find it necessary to label and distinguish them in order to talk about them, we feel it is far more crucial to understand that the fundamental reality is their interconnection and oneness.

So, when you're making your decisions and you're deliberating, I hope that you keep in mind that this is much bigger, and will have much more impact than just this estuary system.

Thank you very much for your time.

HEARING OFFICER FAY: Thank you.

PRESIDING MEMBER KEESE: Thank you.

HEARING OFFICER FAY: Nelson Sullivan.

MR. SULLIVAN: I'm Nelson Sullivan, good evening. I'll try for a bronze star.

I spend a lot of time rowing around on our bay in my dotage. And I often see, not often, but once in awhile I see a lot of jellyfish, hundreds, thousands of them, it's hard to tell.

And I don't imagine a more vulnerable creature to those screens and impingement than a jellyfish.

And I've seen Duke wrestling with them at their intake building; whole crews out there fighting them. But in their data for impingement not a single jellyfish was every caught.

I tried to interest the Regional Water Control Board in that puzzlement, but I couldn't get much of a reaction.

Thank you.

HEARING OFFICER FAY: Thank you.

PRESIDING MEMBER KEESE: You get a gold one.

HEARING OFFICER FAY: Yes, that was very

succinct. John Barta.

MR. BARTA: Good evening. I'd like to speak from the other podium because I have some materials I'd like to put up on the overhead.

HEARING OFFICER FAY: Sure.

MR. BARTA: Once again, good evening, Commissioner Keese, Commissioner Boyd, Hearing Officer Fay. My name is John Barta. I am a Planning Commissioner here in Morro Bay, but I'm speaking as a private citizen this evening.

I'd like to thank you for your patience. You've gone through a lot of mind-numbing days and I know it's all important, and it's kind of late in the day, so I'd like to step back a little bit and sort of take a big picture look, if we can, at some of these issues.

I notice that Dr. Anderson, in his testimony, constantly refers to the importance of the bay, as a national estuary, and a great importance that we all agree on. I'd like to examine that a little deeper.

First of all, there is a process that's been in process for some time through the national estuary program. The national estuary program had a heavy citizen buy-in, and if you read their final report you'll find a list of names, I'm not going to go through any of these names, but I just want to show you the heavy citizen buy-in to this, and organizational buy-in to this. There's a whole list of names. And it goes on for page after page. And I'm proud that my name is among them. And so are many other people who are here to speak to you. None of the experts, frankly. One of them is on there.

So, the community's had a heavy buy-in into this program. And the idea for this program is to identify priority concerns for the bay. This is a long process that's gone on with lots of involvement, scientific and lay.

And in that process I will summarize what this page says with a little note; this is a direct quote from it. "For the past four years a broad group of citizens, scientists, government specialists have been studying the Morro Bay Estuary and watershed. Examining its health; identifying high priority problems and devising a plan of action to address them."

"The MBNEP examined these concerns and together with new studies and those from the past, identified the following seven priority issues."

This is the entire list: sedimentation; bacteria; nutrients; loss of fresh water flow during the dry season; heavy metals and toxic pollutants; loss or degradation of habitat; and loss of steelhead.

That is the entire list. What's important to note is that in the 1999 draft, which I hope here, you'll see that it's a very serious amount of work that went into this, you don't see any mention of entrainment in there.

And even in 1999 period PG&E was involved as one of the partners in that process, and since Duke has been here in town, they've been involved in that process.

In the 2001 final management plan, which is this one, which is, as you can see, a very serious study, also, Duke is mentioned. And basically the report gives it a half a page, which concludes that MBNEP will be like to utilize regulatory data from the organizations and so forth.

And it says, should Duke proceed with their announced plan, it is expected they will be required to address these questions and concerns as part of the CEC process. That is the extent to which this process, all this work, all these people, all this time, mentions the impacts of entrainment, okay.

But what it really is, and what this really -- what the heart of this is, is plans to make the bay better, to save the bay and to make it better. There's 61 action plans in here. And ways to get funding for those plans. Sources are identified. Plans to get the thing implemented is done.

Okay.

PRESIDING MEMBER KEESE: Wrap it up, please?

MR. BARTA: Okay. I'll just cut to the very end, then. They've identified 61 actions. All actions total $165,700,000. High priority actions $139,200,000.

Publicly funded public works actions which are sewer plants and so forth, $95 million of that. Leaving $70 million unfunded. And high priority, only $45 million unfunded.

The bottomline is, and this is really the point I'm trying to make, and I think you should have these documents in evidence so you can consider the benefit to come through these programs.

But the bottomline is this, if the CEC chooses to force dry cooling on Duke, which what the City has told you, -- go for it, but if you go in that direction and you say it must be dry cooling, Duke won't be financially involved in this process, in these dollars.

And so the net result will be if you force Duke to use dry cooling, they are not obligated to provide help to the NEP program. But if you do allow them habitat enhancement mitigation, they will be there with substantial funding.

This is a program that's been developed over years, and it can do a lot of good.

Thank you.

PRESIDING MEMBER KEESE: And I have a feeling we're going to hear a lot about this at our next series of hearings.

HEARING OFFICER FAY: Thanks very much. Pat Renshaw, last speaker.

MS. RENSHAW: Hi, my name is Pat Renshaw, and I'm just a local citizen. I just came from a meeting about the eel grass mitigation hat's going to be taking place. We're going to be planting 3000 groups of ten pieces of eel grass next week. And if any of you are interested in coming and helping out, we could sure use it.

(Laughter.)

MS. RENSHAW: I mean that's the real problem with this whole thing, is that, you know, a few people are trying to do massive things to help save this bay.

And you have a plant that's sucking everything out that you're trying to put in. It just doesn't work. Things take a long time to grow down there. And when you have some of a huge amount coming in and just pulling everything in there, you're not going to have the life that this bay normally has.

It will end up killing the bay. We need to think about other ways of doing things. This is the year 2000 (sic). It's time to look at other sources of power, other ways to do things. And I think that Duke, you know, with the money and the smart people they have, should be able to do that.

And I'm not going to take my full time, but a very famous oceanographer, Sylvia Earle, was speaking up at the Hearst Castle. And one thing she mentioned was the amount of life in a single drop of seawater.

That life is what sustains this planet, what sustains us. And if we don't keep it healthy and alive, we're not going to be around either.

So, thank you.

HEARING OFFICER FAY: Thank you.

PRESIDING MEMBER KEESE: Thank you very much.

HEARING OFFICER FAY: All right, that concludes our hearing. We thank you all for coming.

And we will issue a public notice of the next hearing. Good evening.

(Whereupon, at 6:50 p.m., the hearing was adjourned.)

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CERTIFICATE OF REPORTER

I, JAMES A. RAMOS, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Hearing; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said hearing, nor in any way interested in outcome of said hearing.

IN WITNESS WHEREOF, I have hereunto set my hand this 13th day of June, 2002.